December 1947

TECHNOLOGY REVIEW

Title Reg. in U. S. Pat. Office

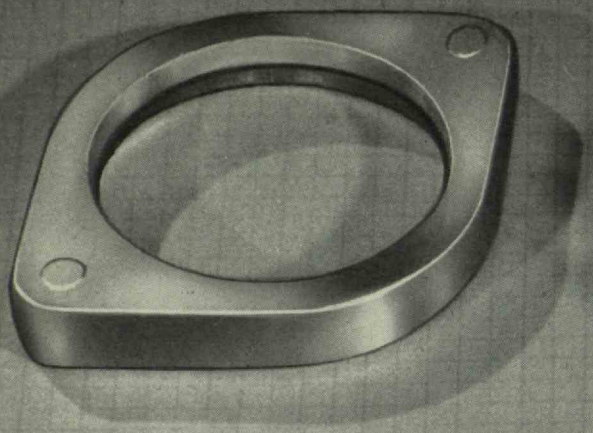


technology
review
Published by MIT

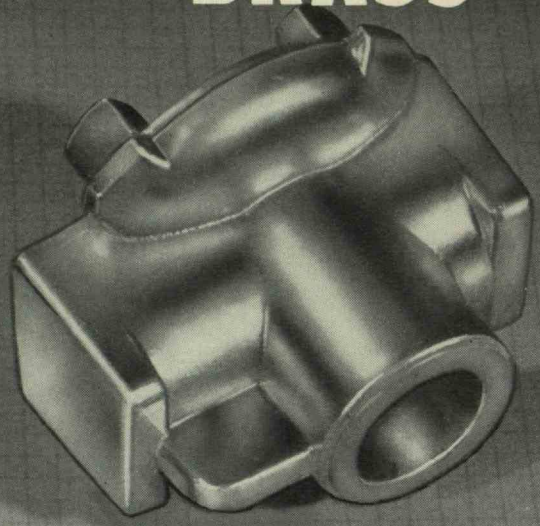
This PDF is for your personal, non-commercial use only.
Distribution and use of this material are governed by copyright law.
For non-personal use, or to order multiple copies please email
permissions@technologyreview.com.

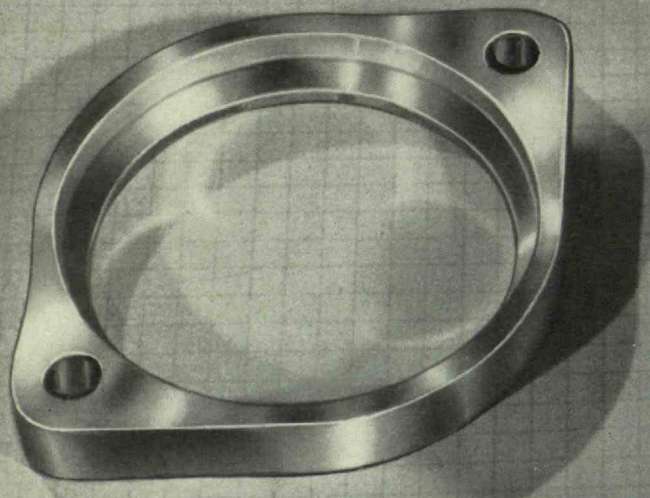
ALUMINUM

BRASS

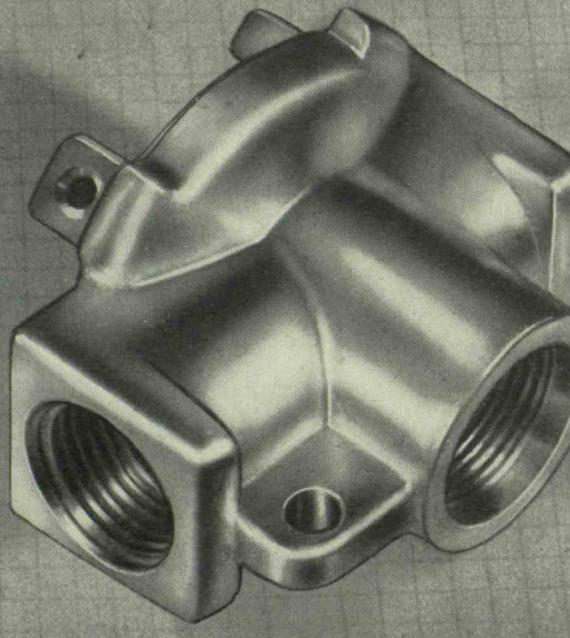


SMOOTH FORGED





MACHINED



THE HARVEY

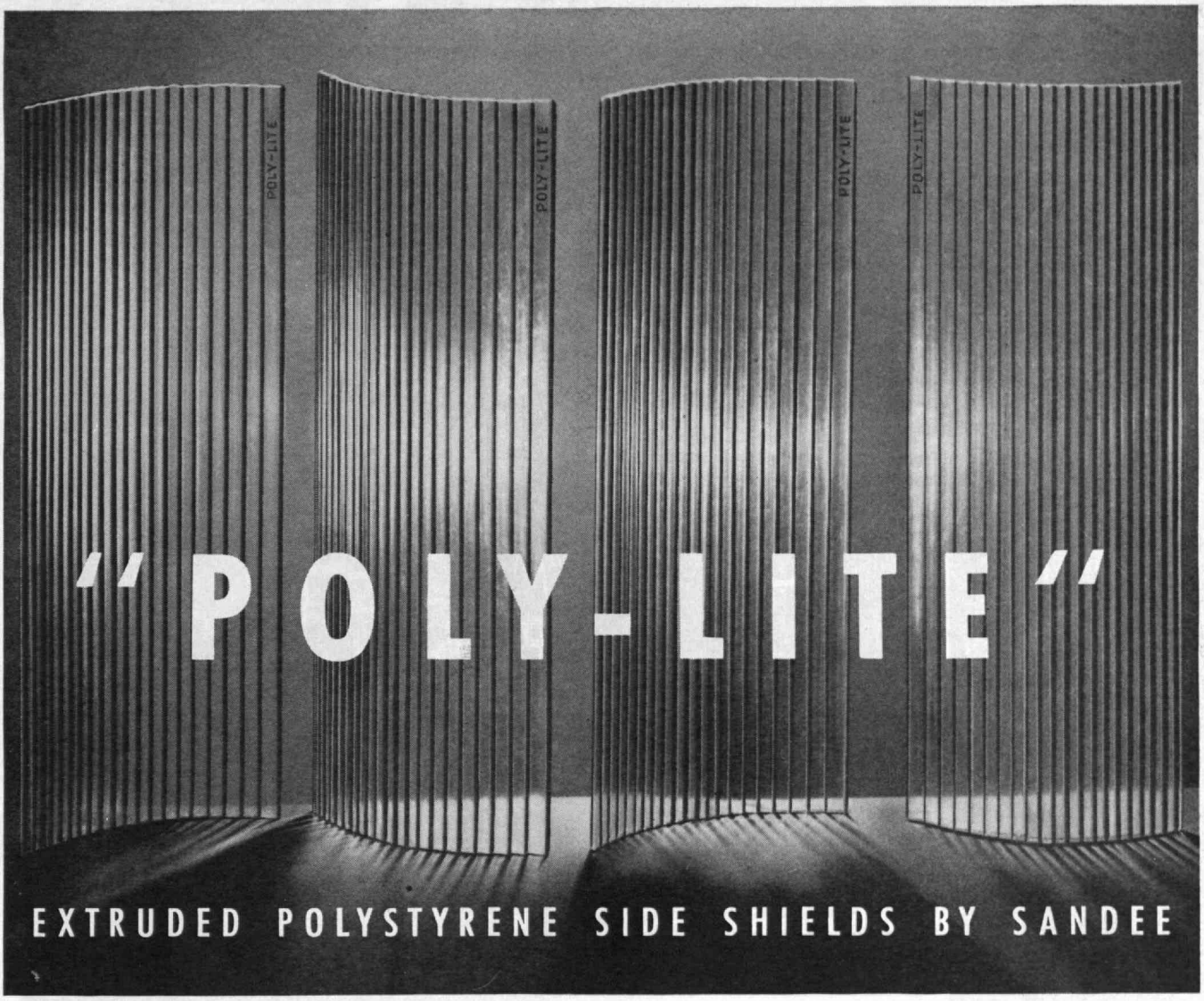
METAL CORPORATION

HAROLD B. HARVEY '05 • *Engineers & Manufacturers* • SHERRY O'BRIEN '17

74th STREET and ASHLAND AVENUE • CHICAGO 36, ILLINOIS

FORGINGS IN ALUMINUM • BRASS • BRONZE • COPPER • MAGNESIUM • MONEL • ALLOYS

MACHINING FACILITIES



PLASTICS have long been recognized as a potential factor in reaching the ultimate in fluorescent lighting. Early trials failed however, because of either unsuitable materials, methods of fabrication, or both.

During the past three years Sandee has developed Polystyrene extrusions to a high degree of efficiency. Today, under the trade name "POLY-LITE" Sandee is manufacturing extruded Polystyrene Side Shields in ever increasing sizes and complicity of shapes. We are constantly adding more and more to the aesthetic and functional qualities of efficient modern fluorescent lighting.

The superior characteristics of Polystyrene in combination with Sandee extrusion technology is unsurpassed in guaranteeing the maximum in modern lighting efficiency! This combination is available to you on request in developing your individualized fixtures.

"POLY-LITE" IS A GUARANTEE OF QUALITY

SALES REPRESENTATIVES IN 19 PRINCIPAL CITIES

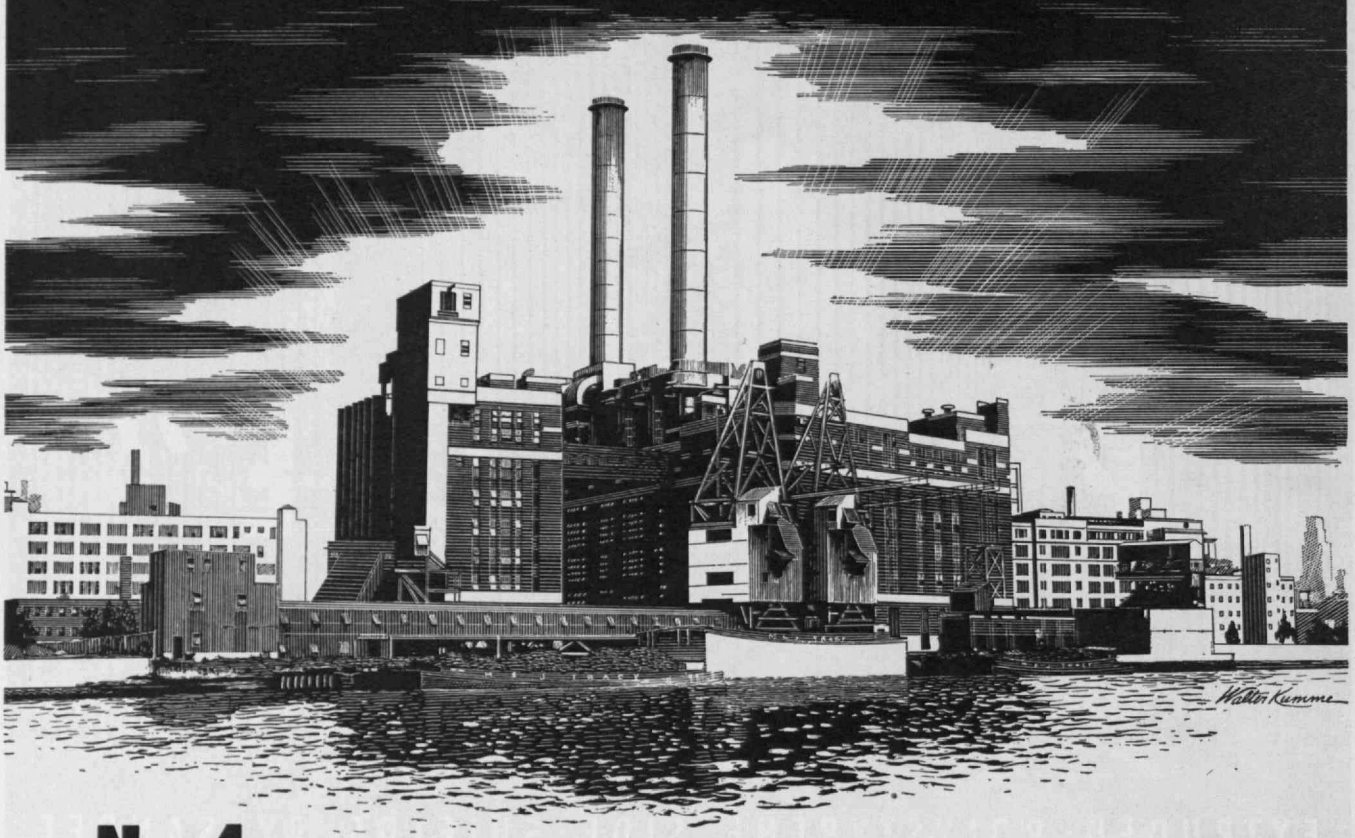
Sandee Manufacturing Company

5050 FOSTER AVENUE • CHICAGO 30, ILLINOIS

EXTRUDED PLASTICS AND SPECIAL TOOLS

THE TECHNOLOGY REVIEW, December, 1947. Vol. L, No. 2. Published monthly from November to July inclusive at 10 Ferry Street, Concord, N. H. Publication date: twenty-seventh of the month preceding date of issue. Annual subscription $3.50; Canadian and Foreign subscription $4.00. Entered as second-class matter at the Post Office at Concord, N. H., under the Act of March 3, 1879.

History-making power stations



No. 4 – *East River Station* — CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.

On November 23, 1926, Queen Marie of Rumania officially opened an electric generating station that made power history from its outset.

East River Station, located at the foot of 14th Street on the East River, was planned in 1924 to assume the rapid load growth of lower Manhattan. It was one of the early users of the completely water-cooled furnace and the first station in the Metropolitan area to use pulverized coal. Its six original boilers, each having a capacity of a quarter of a million pounds of steam per hour, were among the largest in the world.

Hardly had East River begun operation when the need for further expansion became evident. Accordingly plans were made for the addition of three more boilers to be ready for service in 1929. They were the first boilers in the world to generate a million pounds of steam per hour. In fact one unit has been operated at a rate of 1,270,000 pounds of steam per hour – still the highest rate on record. Some idea of the size of such a boiler may be had from the fact that a luncheon for 90 people was held in the furnace of one unit in celebration of its completion.

After eighteen years of service these boilers are still among the most efficient in the country and are also notable for their ability to burn any grade of bituminous coal available. The pulverized fuel equipment, water-cooled furnaces and air pre-heaters of the original installation and the three million-pound units, installed in 1929, are C-E design and manufacture throughout.

The long identification of Combustion Engineering equipment with history-making advances in steam generation at East River and other notable power stations is another reason for coming to C-E for your next boiler unit, whether your steam requirements be large or small.

These three factors are the unwritten plus-values in every C-E contract –

Knowledge – *to solve today's, and tomorrow's, steam generating problems.*

Experience – *to interpret, from a world-wide background in every important industry, the specific needs of each installation.*

Facilities – *to manufacture complete steam generating units for every capacity from 1000 pounds of steam per hour up to the largest.* B-147

COMBUSTION ENGINEERING

200 MADISON AVENUE • NEW YORK 16, N. Y.

Here's What NORTON Makes . . .

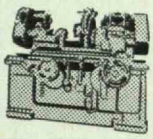
How Many Are You Using?

Abrasive Products



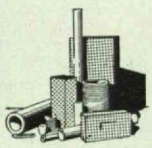
Grinding wheels of ALUNDUM*, CRYSTOLON* and diamond abrasives; discs and segments; bricks, sticks and hones; mounted points; abrasives for polishing, lapping, tumbling and pressure blasting; pulpstones.

Grinding and Lapping Machines



A varied line of machines for production-precision grinding and lapping and for the tool room — including special machines for crankshafts, camshafts, rolls and car wheels.

Refractories



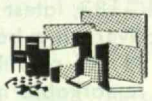
High temperature refractories—grain, cement, bricks, plates, tile, tubes — for metal melting, heat treating and enameling; for ceramic kilns; for boiler furnaces and gas generators; for chemical processes; refractory laboratory ware; catalyst carriers; porous plates and tubes.

Norbide*



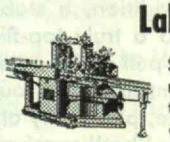
Trade-mark for Norton Boron Carbide — the hardest material made by man. Available as an abrasive for grinding and lapping; in molded products for extreme resistance to wear — especially effective for precision gage anvils and contact points; and for metallurgical use.

Norton Floors



ALUNDUM* Floor and Stair Tile, ALUNDUM* Ceramic Mosaic Tile and ALUNDUM* Aggregates to provide permanently non-slip (wet or dry) and extremely wear-resisting floor and stair surfaces.

Labeling Machines



Single and duplex automatic labeling machines for applying labels and foil to beverage bottles and food, cosmetic and drug containers.

Oilstones and Coated Abrasives

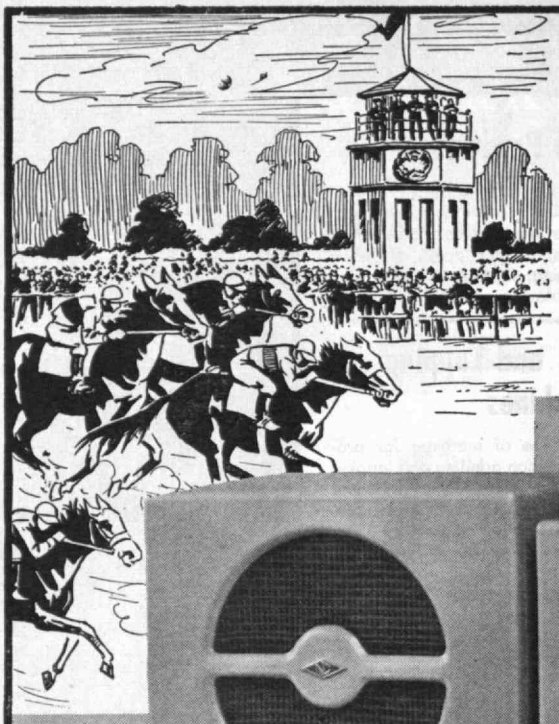


Sharpening stones and abrasive papers and cloth for every use of industry and the home craftsman. Products of the Norton Behr-Manning Division, Troy, New York.

NORTON COMPANY
Worcester 6, Mass.

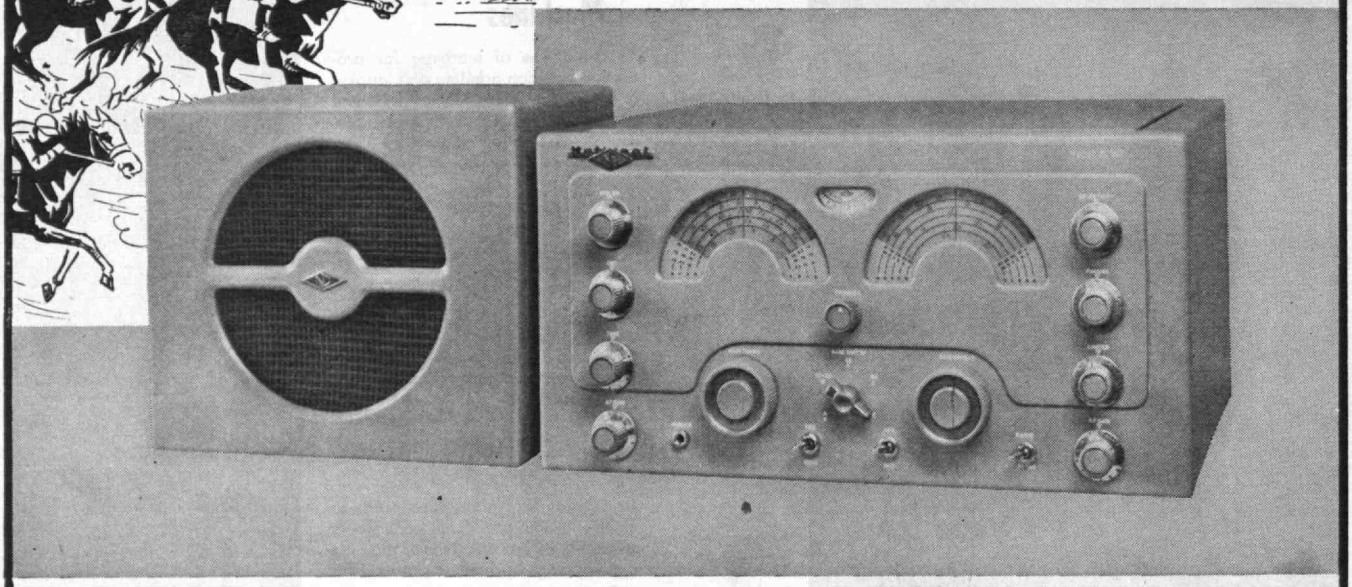
*Trade-marks Registered U. S. Patent Office

NORTON



ANOTHER NATIONAL *FIRST*

THE NC-183



National NC EST. 1914

FEATURES:

- Frequency coverage from 0.54 to 31 Mc Plus 6 meter band. Band-switching on all frequencies.
- Adjustable sensitivity control for S-meter operation on either c.w. or phone.
- Automatic adjustable threshold double-diode noise limiter.
- 115 volts 50/60 cycle AC operation. Easily adapted to 230 volts.
- Amateur Net (Complete with 10" speaker) $269.00

For the first time, a ham receiver incorporating *all* the latest innovations demanded by amateurs is now available at a reasonable price.

The NC-183, latest in National's great new line of communications receivers, is a band-switching set covering frequencies from 0.54 to 31 MC plus the 6 meter band. Two r.f. amplifier stages provide remarkable image rejection and the latest crystal filter aids in maintaining the highest degree of selectivity.

In addition, a stabilized voltage regulated circuit makes the NC-183 a truly top-flight performer on the highest frequencies. A push-pull audio output stage with separate 10" speaker affords excellent fidelity of output.

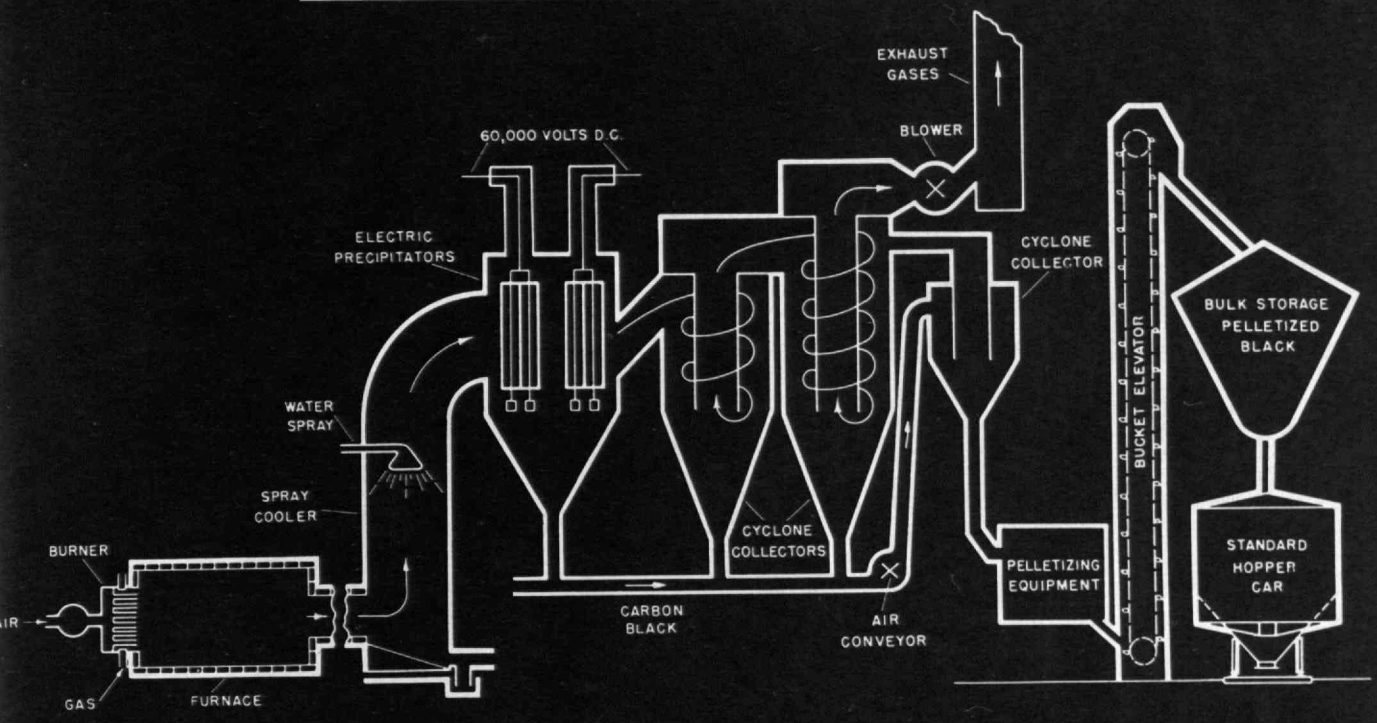
These, plus many other features, combine to make the NC-183 a really "hot" receiver. It will certainly become a strong favorite with those stations that specialize in digging DX out of the background.

See and hear the NC-183 at your nearest National distributor this week.

National Company, Inc.
Dept. No. 18
Malden, Mass.

MAKERS OF LIFETIME RADIO EQUIPMENT

CABOT CARBON BLACK



FURNACE PROCESS

A world of technical know-how goes into the manufacture, shipment and delivery of every pound of Cabot furnace-type carbon black. From the first stage of manufacture to delivery in CABX cars, which were designed by Cabot engineers and built to their specifications, every pound of Cabot furnace-type black is under precise control, every hour of every day, every step of the way.

A new technical bulletin on bulk handling of furnace type black in manufacturers' plants is available.

CABOT

GODFREY L. CABOT, INC.

77 Franklin Street, Boston 10, Mass.

Speed up and Save on PRODUCTION INSPECTION

...with the New TAFT-PEIRCE COMPAIRATOR AIR GAGE



Complete and self-contained to include regulator and filter, this modern air gage is 7" wide, 8½" deep, 8" high and weighs only 12 pounds.

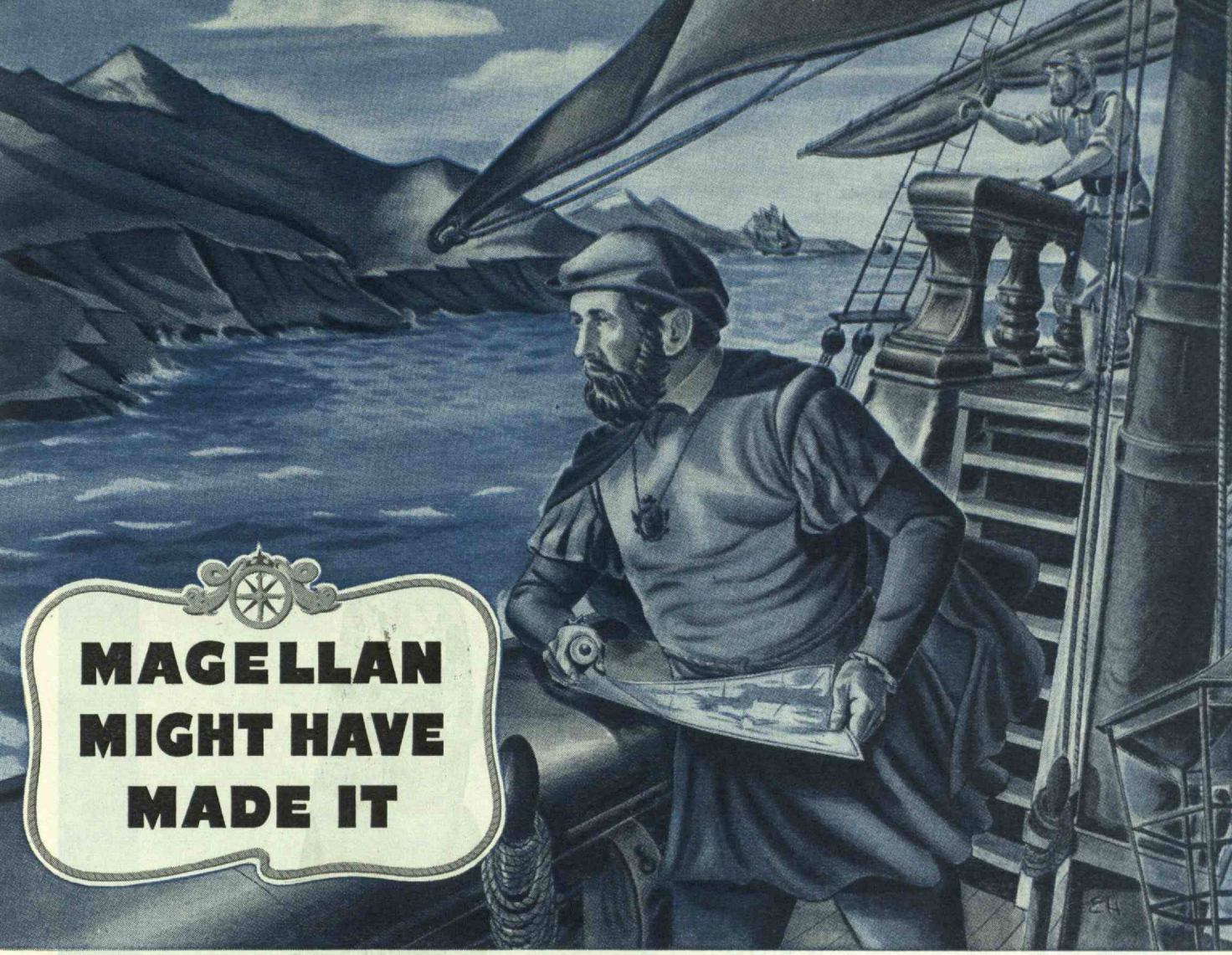
All the operator has to do is to attach the hose to the air line. He needs no special skill to operate the gage, *which measures without mechanical contact.* He easily can check all variations such as taper, out-of-roundness, bell-mouth, and barrel-shaped conditions.

The T-P CompAIRator combines high sensitivity with easy readability. The dial indicator provides accurate readings, *free from pointer-flutter.*

Take the "air-way" to faster and more economical inspection at the machine, at the bench, or in the inspection room. Write for illustrated bulletin on the new CompAIRator to The Taft-Peirce Manufacturing Co., Woonsocket, Rhode Island.

T-P *means* TOP PRECISION

Use TAFT-PEIRCE Gages for Every Gaging Need...



MAGELLAN MIGHT HAVE MADE IT

IN 1519, Ferdinand Magellan set sail in five antiquated vessels in an attempt to circle the globe. He died before the voyage was completed although one of the ships did win through after three years of hardship. With power, even in its most elementary form, Magellan might have lived to see the success of his great adventure.

It was nearly three centuries until the successful voyage of "Fulton's Folly" proved that power at sea was practical. Since then, it has made giant strides of progress and in a short half century, Diesel engines have found an ever-growing usefulness.

Today, internal-combustion engines of all kinds are serving the world in its struggle for reconstruction.

AMERICAN BOSCH CORPORATION SPRINGFIELD 7, MASS.



SERVING POWER

American Bosch serves the internal-combustion-engine industry in three vital ways:

ENGINEERING. 1,200,000 *man-hours* of it have been poured into Diesel fuel injection alone—other millions into ignition.

PRODUCTION. *Premium performance* has been a consistent goal in the production of hundreds of thousands of Diesel injection systems and millions of electrical units.

MAINTENANCE. *The world over,* American Bosch authorized service stations keep the equipment operating efficiently.

AMERICAN BOSCH

PARTNERS IN THE PROGRESS OF POWER

DIESEL FUEL INJECTION • AUTOMOTIVE AND AVIATION ELECTRICAL PRODUCTS



VENTALARM

T. M. Reg. U. S. Pat. Off.

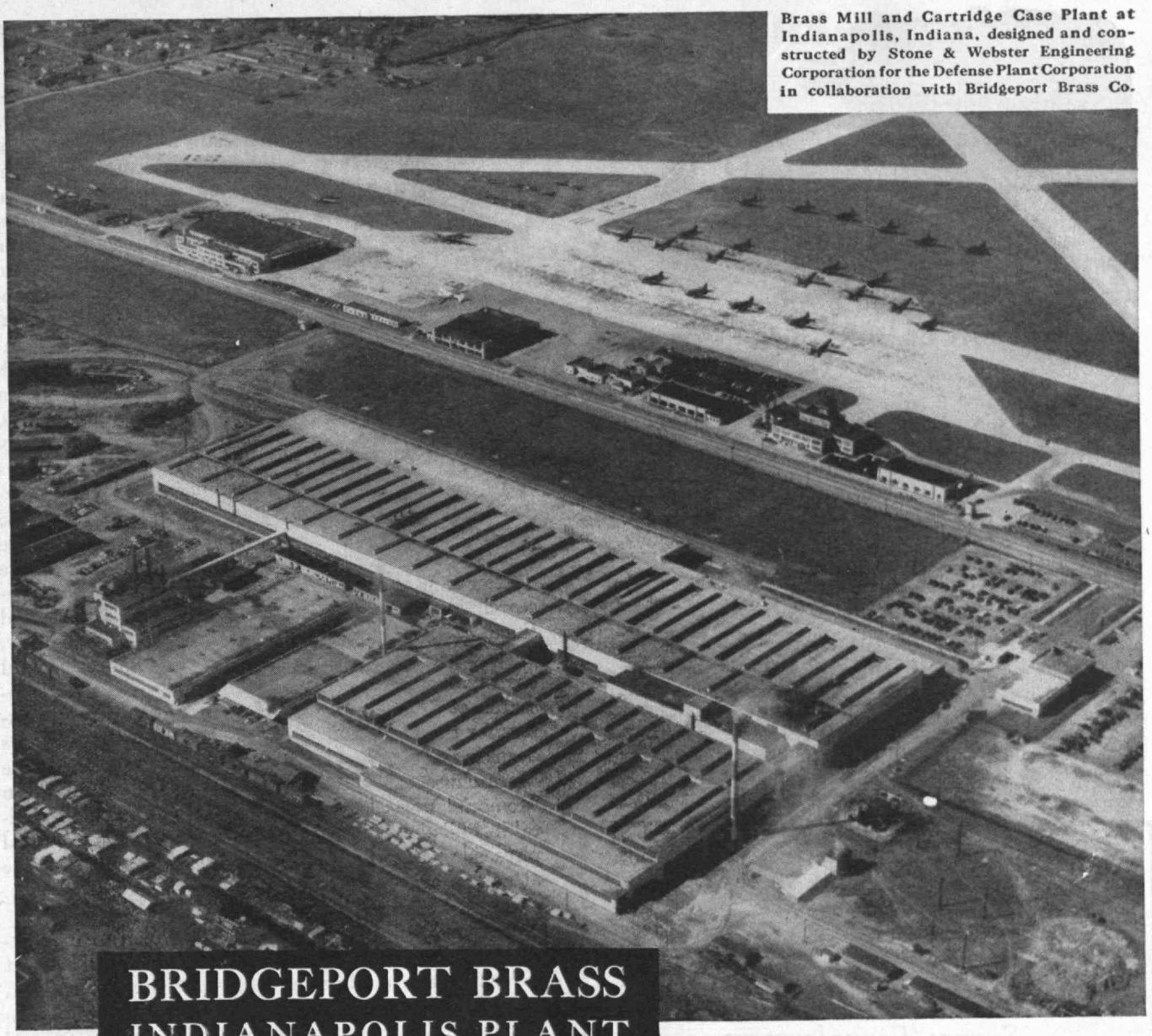
WHISTLING FILL SIGNAL

is also standard equipment on fifteen makes of automotive vehicles.

VENTALARM
GAS TANK FILL SIGNAL

SCULLY SIGNAL COMPANY

88 First Street • Cambridge 41, Mass.



Brass Mill and Cartridge Case Plant at Indianapolis, Indiana, designed and constructed by Stone & Webster Engineering Corporation for the Defense Plant Corporation in collaboration with Bridgeport Brass Co.

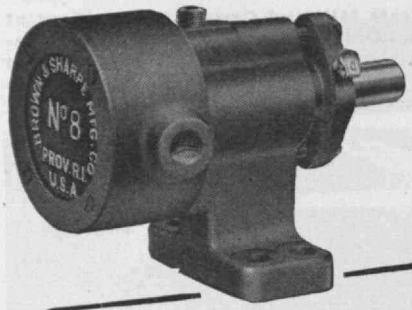
BRIDGEPORT BRASS
INDIANAPOLIS PLANT

IN designing and constructing the Brass Mill and Cartridge Case Plant at Indianapolis, Stone & Webster Engineering Corporation collaborated with Bridgeport Brass Company engineers . . . Provision had to be made for the immediate and variable needs of wartime production . . . During the war it proved to be one of the lowest cost producers of cartridge brass in the country.

Today this efficient plant is again in operation as Bridgeport's mid-western brass mill. The shifting demands of peacetime production were met with a minimum of changes. It stands as an example of sound engineering . . . planned for future needs.

STONE & WEBSTER ENGINEERING CORPORATION

A SUBSIDIARY OF STONE & WEBSTER INC.



No. 8 Vane Pump operates in either direction

... For circulating oil to cutting tools of light metal working machines or for lubricating mechanical units.

Two vanes, rotating in an eccentric ring, alternately produce suction and compression. This gives a constant flow in one direction whichever way driving shaft is rotating. Either side of pump can be used for suction by making a simple adjustment. For construction details and installation dimensions, write Brown & Sharpe Mfg. Co., Providence 1, Rhode Island.

GEARED • VANE • CENTRIFUGAL • MOTOR DRIVEN B·S

BROWN & SHARPE PUMPS

HEVI DUTY

Hevi Duty Electric Co.

Surges Transformers

With the acquisition of the Surges Electric Company of Milwaukee, Hevi Duty can now offer quality dry type air cooled transformers with or without tap changing switches as well as special transformers for special requirements. An accelerated program of modernization will present opportunities for increased production and good delivery schedules.

Write for Bulletin S-4611

HAROLD E. KOCH '22, *President*

ELTON E. STAPLES '26, *District Manager, Cleveland*

HEVI DUTY ELECTRIC COMPANY

HEAT TREATING FURNACES HEVI DUTY ELECTRIC EXCLUSIVELY

MILWAUKEE 1, WISCONSIN

THE TABULAR VIEW

Concerted Attack.—Science cannot yet promise a cure for cancer. Nevertheless, physicians and electrical engineers are, and for many years have been, making a concerted attack on this problem to supplement surgical treatment through the application of roentgen rays to the affected regions of the body. Promising as were some of the early researches in this field, it is now possible to record accelerated progress in the treatment of deep-seated malignancies as a result of physical and clinical research conducted during the last decade. Multimillion-volt generators for producing x-rays, combined with clinical techniques for effectively utilizing such radiation at the malignancy without harming adjacent tissues, have played a major role in recent studies, as JOHN G. TRUMP, '33, relates (page 91) in "Roentgen Rays against Cancer." Professor Trump received his bachelor's degree in electrical engineering from the Polytechnic Institute of Brooklyn in 1929, a master of arts degree from Columbia University two years later, and the doctorate of science from M.I.T. in 1933. He was a research associate at the Institute from 1933 to 1936 and since 1936 has been a member of the Faculty. Currently, he is associate professor of electrical engineering and chairman of the Faculty Club. Professor Trump's research at M.I.T. on supervoltage roentgen ray generators for the treatment of deep-seated malignancies has been carried on with the co-operation of physicians at the Massachusetts General Hospital, Harvard's Huntington Memorial Hospital, and the American Oncologic Hospital in Philadelphia in a program in which engineers and physicians alike are making a concerted and effective attack on cancer.

Tomorrow's Metals.—Those metals which are in greatest use today are not necessarily those which will be most diligently sought after by future generations. In fact, current indications are that, at the present rate of production and consumption, a number of metals essential to our present-day economy may well become exhausted in the lifetime of persons now living. Indeed, we are coming to recognize generally that our metals are by no means inexhaustible — a statement which is also true of other natural resources. How long, then, may we draw upon our mineral resources at our present rate of use? What metals does the United States consume in greater quantities than it produces? How can this country best husband and use supplies of metals for which it is not self-sufficient? In "How Long Will Our Metals Last?" CARLE R. HAYWARD, '04, Emeritus Professor of Process Metallurgy, skillfully sets forth (page 96) authoritative views on this timely topic. A program of conservation which Professor Hayward proposes is one the adoption of which would benefit all nations. A recognized authority on process metallurgy, Professor Hayward has written extensively in his field, and has dealt especially with copper, lead, and zinc — all metals for which this country's demand may soon seriously outstrip its domestic supply. A native of Yankton, S. D., Professor Hayward became an instructor in science at the Bellows Free Academy in Fairfax, Vt., following his graduation from M.I.T. in 1904. In 1906 he joined the Institute's

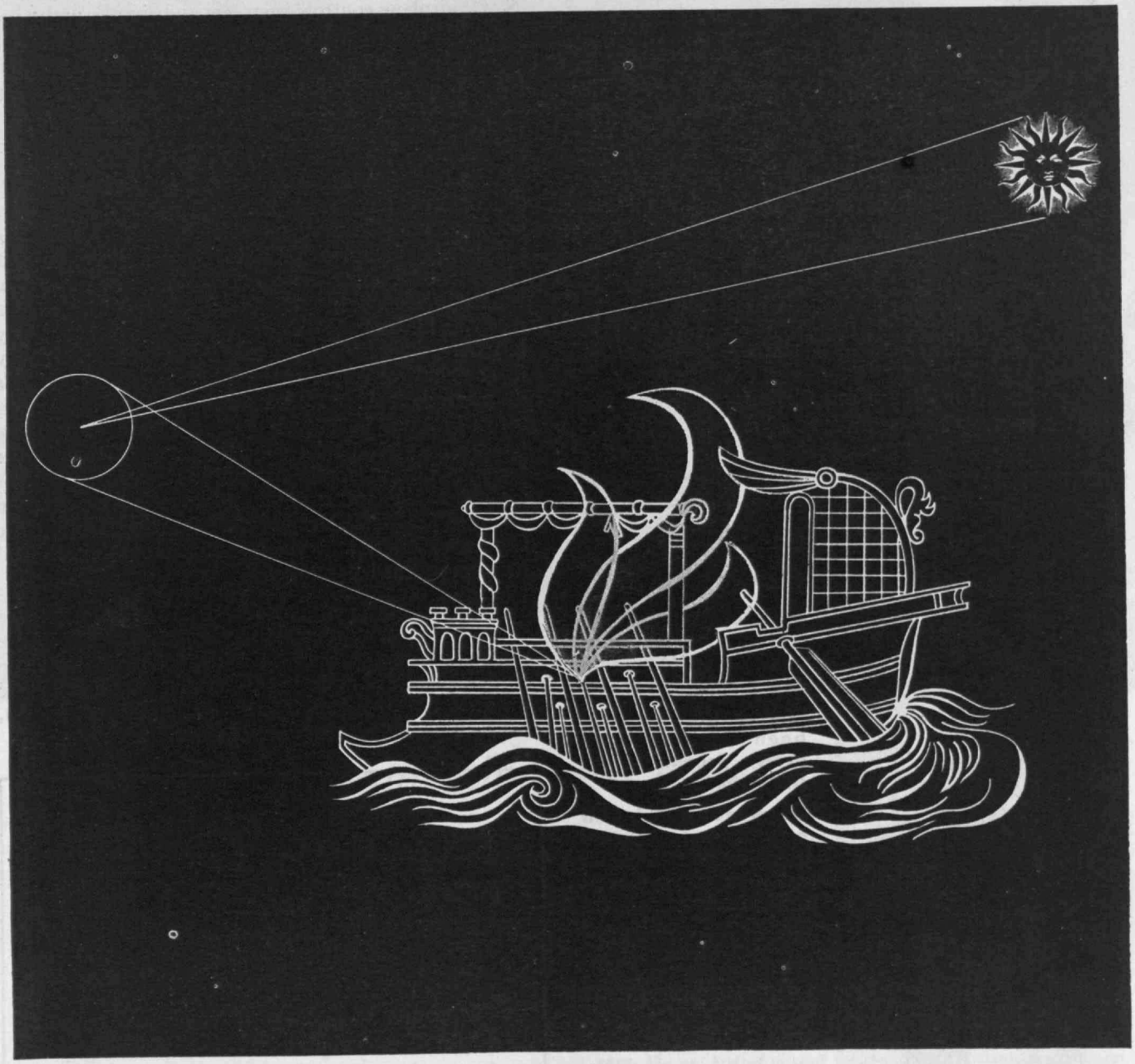
(*Concluded on page 84*)

IT ISN'T DONE WITH MIRRORS—TODAY

When the Roman fleet tried an amphibious operation at Syracuse, they ran into a problem of high temperature condition that completely nonplussed them. Archimedes, according to legend, burned them up by focusing the sun's rays on them with mirrors.

Modern problems of operation at high temperatures are solved quite simply by using molybdenum steels. Their creep strength and excellent properties at elevated temperatures assure good performance when the heat is on.

We will be glad to send detailed information concerning the types of molybdenum steel suitable for operation at elevated temperatures.



MOLYBDIC OXIDE—BRIQUETTED OR CANNED • FERROMOLYBDENUM • "CALCIUM MOLYBDATE"
CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.

Climax Molybdenum Company
500 Fifth Avenue · New York City

MOLY



TO GET THE MOST OUT OF HACKSAWS AND BAND SAWS



Starrett Hacksaw Booklet "L" describes the complete line of Starrett Hacksaw Blades for hand frame and hacksaw machine and Starrett Band Saws for cutting metal, wood and other materials. Starrett Cutting Chart instantly gives complete information for cutting any material by hacksaw or band saw. Write for copies.



Buy Through Your Distributor

THE L. S. STARRETT CO. • ATHOL • MASS. • U. S. A.

World's Greatest Toolmakers



Let's Be Correct . . .

There can be no room for inaccuracies when handling tolerances in gear making.

Precision practices have been developed in every department at Diefendorf.

Gears for nearly all purposes—of all metals—and non-metallics as well. Custom made, exclusively, to your most precise specifications.

•

DIEFENDORF GEAR CORPORATION

Syracuse 1, New York

DIEFENDORF GEARS

THE TABULAR VIEW

(Concluded from page 82)

instructing staff. He has long been sought as a consultant in his field and assisted in developing the present process for producing oxygen-free copper. He has also translated a number of books in the field of metallurgy.

Automatic Control.—When the Wright brothers first lifted their heavier-than-air machine at Kitty Hawk, N. C., airplane controls were few and simple, and what navigation was required could be carried out by direct observation. As the speed and complexity of aircraft increased throughout the years, the pilot was forced more and more to depend upon instruments to aid his flying. Now, with airplanes traveling at velocities near that of sound, it is becoming increasingly necessary to replace human control by automatic control of aircraft, as ROBERT C. SEAMANS, '42, relates (page 102). Not only does automatic control minimize fatigue of operating personnel in planes in which it is currently employed, it also increases the reliability of flying in all kinds of weather, and makes possible new uses for airplanes. Upon receiving his bachelor's degree from Harvard University in 1940, Mr. Seamans came to M.I.T. for graduate study in aeronautical engineering and received his master's degree in this field in 1942. He was appointed an instructor in 1941 and in 1945 was promoted to assistant professor of aeronautical engineering. In addition to his teaching, he is currently engaged in research on aircraft controls in the Instrumentation Laboratory directed by Professor Charles S. Draper, '26. His article "Automatic Control of Aircraft" is the result of recently conducted research in this laboratory.

Rogers Building.—Illustration on the Contents page shows the main entrance of the Rogers Building where photoelectric controls open the heavy doors to welcome students, Faculty, and guests. The photograph was made by an M.I.T. student, DANIEL S. MCDERMOTT, '50, whose work has also appeared in Boston newspapers.

Speed with Economy



Chas. Pfizer & Co., Inc.

The ability to build *quickly* and *well* is not acquired overnight . . . When you engage us, you have an organization that has been geared for fast, closely-coordinated service ever since its formation — 30 years ago.

W. J. BARNEY CORPORATION

101 PARK AVENUE, NEW YORK

INDUSTRIAL CONSTRUCTION

Alfred T. Glassett, '20, Vice President

"—mountains are leveled and oceans bounded by the slender force of human beings"—SAMUEL JOHNSON



Why communications get better all the time

YOUR VOICE girdles the globe in one-seventh of a second.

It travels at 186,000 miles per second—the speed of light—thanks to the telephone and radio. And by television, so do the pictures of any event as it occurs.

What has made this blinding speed possible? What has given us these "ringside seats"... to see, to hear, to share in the headline news of the day?

The answer: Greater knowledge of electronic waves and better materials to harness them. For example, the vacuum tube—heart of radio or television—depends upon the greatest possible absence of air or other gases—a high vacuum. Most of the air is pumped out before the tube is sealed. Then a tiny bit of barium, called a *"barium getter"* is flashed inside of it by electricity. This captures the remaining air and gives a nearly perfect vacuum.

Unending research and engineering have also provided finer plastics for insulation, purer graphite and carbon for electronic devices... and a host of other basic materials that help shave the speed of communications to the tiniest splinter of a second.

Producing these better materials and many others—for the use of science and industry and the benefit of mankind—is the work of the people of UNION CARBIDE.

FREE: *You are invited to send for the illustrated booklet, "Products and Processes," which describes the ways in which industry uses UCC's Alloys, Carbons, Chemicals, Gases and Plastics.*

UNION CARBIDE
AND CARBON CORPORATION
30 EAST 42ND STREET UCC NEW YORK 17, N. Y.

Products of Divisions and Units include

LINDE OXYGEN • PREST-O-LITE ACETYLENE • PYROFAX GAS • BAKELITE, KRENE, VINYON, AND VINYLITE PLASTICS
KEMET GETTERS • NATIONAL CARBONS • EVEREADY FLASHLIGHTS AND BATTERIES • ACHESON ELECTRODES
ELECTROMET ALLOYS AND METALS • HAYNES STELLITE ALLOYS • SYNTHETIC ORGANIC CHEMICALS

Leading auto makers switch to new kind of tire

Call Super-Cushion by Goodyear greatest tire advance in 15 years

Bigger, softer tire runs on only 24 pounds of air; gives incredibly smoother ride, greater mileage and safety, better car handling

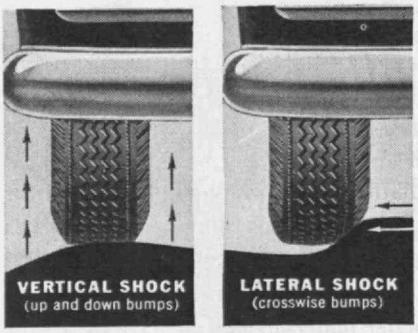
MANY LEADING auto makers are switching to a new *kind* of tire for their latest cars.

The automobile engineers who tested the new Super-Cushion by Goodyear said: "We want this tire for our new cars—*now!*" Here's *why* they didn't want to wait:

First tire to lick lateral shock

Till Goodyear produced the Super-Cushion, lateral (crosswise) shock was one of the few things yet to be licked in the modern motor car. Pillowy Super-Cushions soak up crosswise jolts.

This means not only a more luxurious ride—but less wear and tear on *every part of your car*. Result: *longer life for your car!*



• This shows the two kinds of road shock your car gets. The new Super-Cushion by Goodyear is the first tire to lick lateral shock.



• Leading car makers found Super-Cushions made an astonishing improvement in motor car operation. They said: "We want them for our new cars *now!*" In 1948 Super-Cushions will be standard equipment on many new cars.

Easier, safer car handling

Bigger, softer Super-Cushions run on *only 24 pounds* of air pressure instead of the usual 28 to 32, give an unbelievably smoother ride on bad roads and *even on good ones!*

And these tires bring an indescribable new ease and security to driving. Your car hugs the road better, seems to *float* through traffic. You get safer steering, easier handling—especially on curves.

Since Super-Cushions are softer, they "roll with the punch," are harder to cut or bruise. And because they run cooler they build up less pressure and consistently *average more mileage than the finest standard tires.*

How to get Super-Cushions

To get Super-Cushions for your present car, see your Goodyear dealer *now*. He's getting them in steadily increasing quantities, though not fast enough to take care of the huge demand.

But come in today and see and order the new Super-Cushions. The sooner you place your order, the sooner you'll be able to enjoy a wonderful new *kind* of ride.



The new *Super-Cushion* by GOODYEAR

VOL. 50 No. 2

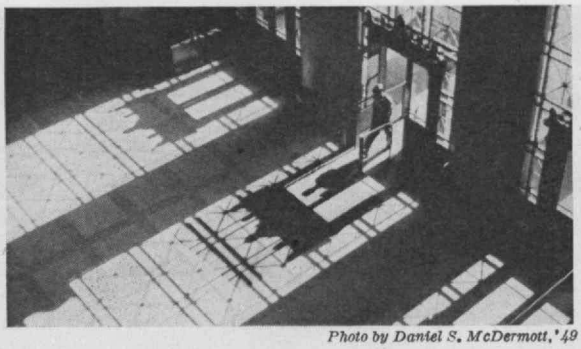


Photo by Daniel S. McDermott, '49

THE TECHNOLOGY REVIEW

TITLE REGISTERED, U. S. PATENT OFFICE

EDITED AT THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY

☆ ☆ ☆

Contents for December, 1947

MORNING STROLL • *Photograph by Axel Bahnsen* . . . . . THE COVER

SUNDOWN ON THE CUYAHOGA VALLEY STEEL INDUSTRY • *Photograph by H. M. Mayer from Black Star* . . . . . FRONTISPIECE 88

ROENTGEN RAYS AGAINST CANCER . . . . . *By* JOHN G. TRUMP 91
Not yet can science promise a cure for cancer. But supervoltage x-rays and improved clinical methods for utilizing such radiations more effectively mark recent important advances in combating this dread disease

HOW LONG WILL OUR METALS LAST? . . . . . *By* CARLE R. HAYWARD 96
Judged by present production and use, the world no longer has an inexhaustible supply of metals. Present supplies can be stretched by technological advances, conservation measures, and world-wide peace

AUTOMATIC CONTROL OF AIRCRAFT . . . . . *By* ROBERT C. SEAMANS, JR. 102
Automatic control opens up new uses for aircraft traveling near the velocity of sound; it also reduces the fatigue of operating personnel and minimizes human errors in operating airplanes now in daily use

THE TABULAR VIEW • *Contributors and Contributions* 82

THE TREND OF AFFAIRS • *News of Science and Engineering* 89

THE INSTITUTE GAZETTE • *Relating to the Massachusetts Institute of Technology* 105

☆ ☆ ☆

Publisher • H. E. LOBDELL *Editor* • B. DUDLEY *Business Manager* • R. T. JOPE
Editorial Associates: PAUL COHEN • T. L. DAVIS • J. R. KILLIAN, JR. • WILLY LEY • F. W. NORDSIEK
J. J. ROWLANDS • D. O. WOODBURY
Editorial Staff: THEODORA KEITH, RUTH KING *Business Staff:* MADELINE R. MCCORMICK

Published monthly from November to July inclusive on the twenty-seventh of the month preceding the date of issue, at 50 cents a copy. Annual subscription, $3.50; Canadian and foreign subscription, $4.00. Published for the Alumni Association of the M.I.T.: Raymond H. Blanchard, President; H. E. Lobdell, Executive Vice-president; C. George Dandrow, John A. Lunn, Vice-presidents; Charles E Locke, Secretary; Ralph T. Jope, Treasurer. Published at the Rumford Press, 10 Ferry Street, Concord, N. H. Editorial Office, Room 7-203, Massachusetts Institute of Technology, Cambridge 39, Mass. Entered as second-class mail matter at the post office at Concord, N. H. Copyright, 1947, by the Alumni Association of the Massachusetts Institute of Technology. Three weeks must be allowed to effect changes of address, for which both old and new addresses should be given.

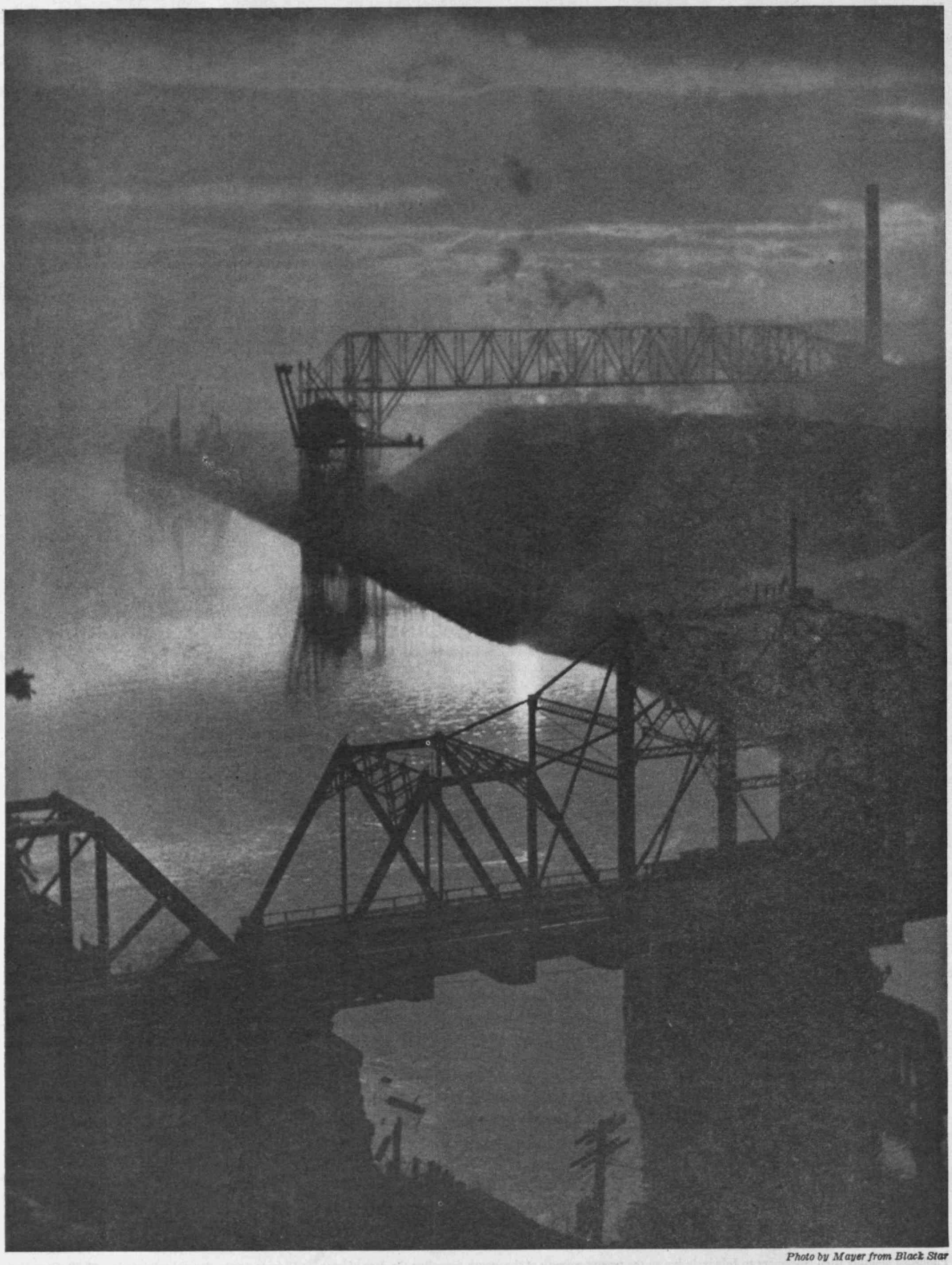


Photo by Mayer from Black Star

Sundown on the Cuyahoga Valley steel industry

THE
TECHNOLOGY
REVIEW

Vol. 50, No. 2 December, 1947

The Trend of Affairs

Cold — on Tap

THERMAL motion of the molecules masks the effects predicted by the laws of quantum mechanics. It is for this reason that temperatures near absolute zero are essential for much research directed toward a better understanding of the properties of matter. The true equilibrium state of many chemical reactions, for example, can be determined from thermodynamic constants which can be computed from measurements made at very low temperatures. But research at temperatures near absolute zero has been seriously hampered, heretofore, because scientists have been forced to devote a disproportionate amount of time and effort to the wholly subsidiary problem of first obtaining low temperatures. Now the commercial availability of a refrigerator par excellence, the helium cryostat, removes this obstacle as a deterrent to low-temperature research. With temperatures of within two or three degrees of absolute zero on tap research workers can go about their intended investigations, freed from the plague of operational details implied by the second law of thermodynamics.

Packaged cold may now be delivered from a helium liquefying refrigerator cabinet five feet high and occupying a floor space of six square feet, exclusive of a ten-horsepower compressor and low-pressure gas container. The complete unit weighs about 2,800 pounds, occupies less than 50 square feet of floor space, and starting from room temperature can reach a temperature of two degrees Kelvin in about two hours.

Inventor of the helium cryostat is Samuel C. Collins, Associate Professor of Mechanical Engineering at M.I.T., who assisted Dr. Howard O. McMahon, '41, and Allen Latham, Jr., '30, of Arthur D. Little, Inc. in the development of the commercial units. In a paper presented before the American Institute of Chemical Engineers in Detroit on November 11, Messrs. McMahon and Latham described the engineering details of the Collins helium cryostat, although a preview of this important development was recorded in the article "Progress in Low Temperature Refrigeration" by Dr. Collins in the January, 1947, issue of The Review.

Cultured Crystals

DURING World War II the American and British navies sank about 1,000 enemy submarines. One of the most important weapons in this underwater warfare was sonar, the recently developed system for locating, tracking, and ranging underwater targets by sound waves. In most of these sonar gears the actual generating and detecting of the sound waves were done by a multiplicity of piezoelectric crystals which change their dimensions slightly when placed in an electric field, or conversely, which generate a tiny electric potential difference between opposite faces when the crystals are stressed mechanically. Quartz, Rochelle salt, and tourmaline are among the better known examples. Such crystals are fairly common household items, for many home phonographs have a small Rochelle salt crystal in their pickup arms. When vibrated by the needle as it follows the record groove, the crystal generates an electric voltage of corresponding wave form which eventually emerges from the loud-speaker as music. For some of the more exacting requirements of electronics, and particularly for establishing the carrier frequency at which radio transmitters generate their signals, quartz crystals are required in such quantities that during the war they were one of our high priority imports.

In a search for materials having more desirable performance characteristics than either quartz or Rochelle salt, the designers of one of our most widely used sonar gears picked crystals of ammonium dihydrogen phosphate (ADP for short) to serve as their transducers in converting the actuating electrical energy into the actual sound waves in the water. A companion type of synthetic crystal is potassium dihydrogen phosphate, or KDP. About 20,000,000 crystals of these types have been produced.

Under a rigid schedule of temperature control, large crystals of ethylenediamine tartrate are painstakingly grown at the Bell Telephone Laboratories before finding their ultimate use in communication equipment. At the right are shown a number of EDT crystals which have already grown to considerable size. Before the crystals are suitable for use, they must be cut to approximate size and then ground and polished to the desired dimensions, as shown below.





Photos by Nick Lazarnick

Since there is no natural source for either one of these crystals, they were grown synthetically in a manner that quickly took on the characteristics of a high production, highly mechanized industry. A substantial precedent exists, of course, in the well-established practices for growing Rochelle salt crystals from supersaturated water solutions.

A new competitor of quartz, recently announced by the Bell Telephone Laboratories, is ethylenediamine tartrate, or EDT, for which the principal peacetime use is in telephone equipment. Facilities for producing this type of crystal by the hundreds of thousands annually are now available. Nor do these figures refer to tiny crystals that are best scrutinized with a magnifying glass. The minimum commercially usable cross section is about one inch square, with production bars closer to two inches square and nine inches long. Crystals a foot long have been produced.

As Dr. Albert C. Walker, '18, explains in the October issue of the *Bell Laboratories Record*, crystal culture calls for patience and precision. Starting with a "seed" crystal, which is usually a good sized slab cut at the proper orientation from a previously grown crystal, it may take a month to grow a unit of commercial size, the temperature of the solution having dropped continuously a fraction of a degree per day throughout this period. In the large rooms where the crystals are grown, thousands at a time, the controls must be able to produce a required temperature held constant to 0.1 degree C. Since the solutions are supersaturated, they not only deposit on the growing faces of the seed crystals, they tend to start small and unwanted crystals all over the tank. Forcing the rate of growth exaggerates this trouble and also causes cloudy areas to be produced in the crystal.

Although these crystals are grown from solution, they bring to mind an earlier development in which M.I.T. played an active part which has also become a small industry. That is the production of a wide variety of crystals from their melts, in sizes which, by natural standards, can only be termed immense. Whereas the crystals previously enumerated are used almost without exception for their piezoelectric effects, the latter are generally utilized for optical purposes. Among the more widely used salts of this type are lithium fluoride, important for its excellent transmission of ultraviolet rays, and potassium bromide, desired for lenses and prisms in infrared spectroscopes.

In the 1930's Dr. Donald C. Stockbarger, '19, Associate Professor of Physics at M.I.T., developed a technique for growing crystals of lithium fluoride. He used two tubular vertical furnaces, one on top of the other, placing between them an annular baffle that created a localized and steep temperature gradient. The melt freezes into a single crystal as it is lowered through this gradient. The salts must be kept free of impurities and foreign particles, or the resulting crystal will be cloudy, discolored, or distorted. Such defects occur frequently in the natural product, as well as in synthetically grown crystals, and render the crystals unsuitable for optical use.

Roentgen Rays against Cancer

Research in the Generation of Multimillion-Volt X-rays and Improved Clinical Techniques Marks Recent Progress in Treatment of Deep Malignant Tumors

By John G. Trump

THE disease to which Hippocrates in the Fourth Century B.C. applied the enigmatic and disquieting name of "cancer" is now for the first time marked for open battle by the combined forces of science, medicine, and enlightened public opinion. Cancer has made a vivid and fearful impression upon the human mind since antiquity. The earliest account of some of its clinical symptoms is recorded in an Egyptian papyrus of the Fifteenth Century B.C. Many observations of its nature had been made by the end of the Hippocratian era, and further accurate classification of the disease was accomplished in 150 A.D. by Galen, whose principles persisted until the Nineteenth Century. Today the ultimate nature and causes of cancer are still largely a riddle, but knowledge of its almost infinite manifestations and factors affecting them is steadily advancing. While cancer the disease is growing in social importance, the successes in cancer research and therapy have been many and can now occasionally offer hope of complete clinical cure. In this battle against the most mysterious and baffling of human diseases, the armamentarium of humanity includes the techniques of the physicist, chemist, geneticist, biologist, bacteriologist, as well as the internist, surgeon, and radiologist. Most recently, because of the critical need for early diagnosis and enlightened response, the general public is being awakened to its necessary role in this developing conflict.

Among the civilized countries of the world, cancer is now definitely second only to the diseases of the heart as a cause of death. In the United States about 175,000 people die annually of this disease. More than one in ten, about equally divided between men and women, are destined to die of cancer. The apparent rise through the years in the incidence of this disease is undoubtedly due to improved diagnosis and to the increasing age of populations, for cancer preferentially strikes those of middle and advanced age, although certain types, such as embryonal tumors, are more common in early life. Several hundred varieties of malignant tumors are now recognized, and their characteristic development has been the subject of clinical observation for many years. More important, fundamental processes in the origin of cancer and its control are the subject of intensive research. The genetic factor in the incidence of cancer has been studied in both men and animals, as well as the carcinogenic effect of mechanical irritation, of certain chemical compounds, of bacteria, of viruses, and of exposure to radiation. The study of transplantable tumors and the factors contributing to the development of the graft or the maintenance of immunity, the possibilities of ionizing radiation to inhibit the growth or to destroy malignant tissue, the use of hormone and certain chemical inhibitors, and a host of other types of fundamental biologic, physical, and clinical research are throwing light on the basic problem of cancer.

Two Accepted Forms of Cancer Therapy

Even with this long background of intensive investigation, the only two accepted methods of treatment for cancer are surgery and radiation therapy. With few scattered exceptions, it is only by completely exorcising the malignant tumor or by removing it *in situ* with cell-destroying radiations that this disease can now be



Pioneering work in radiation therapy with x-rays produced by over one million volts was made possible by the M.I.T. designed air-insulated electrostatic generator at the Huntington Memorial Hospital. More than 1,000 patients have been treated with this unusual equipment which established many of the advantages of supervoltage radiation for deep cancer therapy.

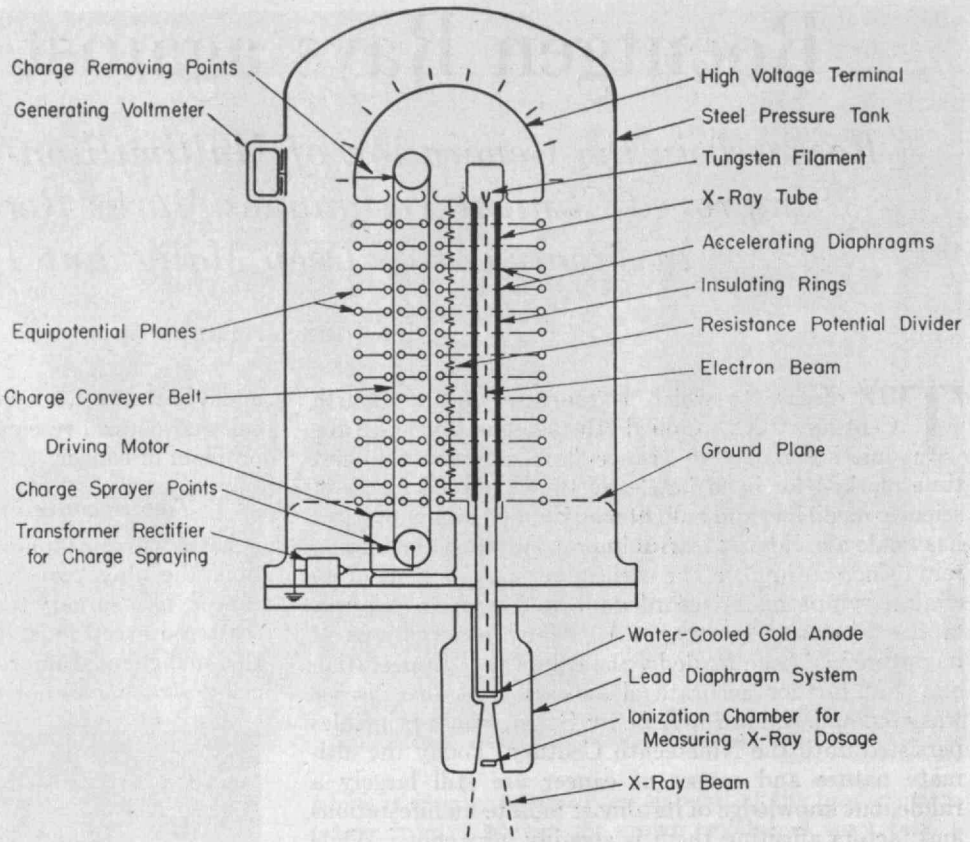


Diagram of an electrostatic x-ray generator. Following the original suggestion of R. J. Van de Graaff, electric charge is transferred to the high-voltage terminal at a continuous rate by a belt of insulating material. This charge maintains the terminal at a steady negative potential with respect to ground, and supplies the electrons required by the acceleration tube. Both tube and belt are mounted within the insulating column which is especially designed to insure a uniform voltage distribution between terminal and the ground plane. Electrons emitted from the hot tungsten filament at the high potential end of the tube are progressively accelerated and focused as they pass along the acceleration tube and thus acquire the full potential of the terminal. On impact with the water-cooled gold anode, the kinetic energy of the electrons is transferred into penetrating radiant energy. Since this radiation is emitted in all directions, a lead diaphragm system is used to absorb the unwanted radiation and to define the beam of ionizing radiation used in therapy. Except for the interior of the highly evacuated x-ray tube, the entire apparatus is insulated by compressed gas at a pressure of 27 atmospheres. It is this feature which permits these instruments to be built with unusual compactness.

controlled or eliminated. Both these techniques, often used in combination, have resulted in thousands of clinical cures, particularly in the case of superficial malignancies or in deep tumors detected in their early stages. Both these techniques have improved steadily with time. The former has progressed because of the increasing skill of the surgeon and the anesthetist and their techniques now permit the removal of new growths from nearly any organ or tissue of the body. The latter has depended upon the development of new and more effective forms of radiation intelligently employed by the radiologist. Cancer of the lip, mouth, larynx, uterus, and bladder is often treated by radiation alone. In addition, radiation plays an indispensable role in combination with surgery for the control of many other types of malignant tumors. It is in the field of radiation therapy that significant contributions have been made by the research groups at M.I.T., where engineering, physical, and clinical research on cancer has been in progress for more than a decade.

Supervoltage Roentgen-Ray Treatment

The problem of the radiologist is to deliver to the malignant tumor such a quantity of ionizing radiation as to effect its gradual, but complete destruction while causing only a tolerable injury to surrounding healthy tissue. Particularly in the treatment of deep tumors and those concerned with vital organs has the use of penetrating and ionizing radiation been indispensable. Within a few months of Roentgen's discovery the therapeutic, as well as the diagnostic, value of x-rays had been noted, and x-rays were being employed for the treatment of superficial lesions. A few years later, Madame Curie's brilliant isolation of radium, whose products emit a similar but far more penetrating radiation, added another powerful tool for therapy. During the next 50 years the relatively low-voltage and easily absorbed roentgen rays available to Roentgen's medical confreres have been gradually increased to about 250 kilovolt radiation for the deep-therapy application. The limited amount of radium is used to an increasing extent only in direct application to accessible tumors — those on the surface or accessible through the body orifices. In interstitial therapy the gamma-ray emitting needles or seeds are inserted into the tumor mass. Deep tumors, the most serious clinical problem, are now universally irradiated with roentgen rays in the 250-kilovolt energy range, assisted in certain cases by gamma-ray irradiation.

That higher voltages would produce a superior quality of radiation for deep therapy has been appreciated for many years. During the last decade, however, less than a dozen clinical institutions in the world have had available x-ray sources operating in the vicinity of one million volts. Dr. Robert S. Stone of the University Hospital in San Francisco has treated patients since 1935 with million-volt radiation produced by the ingenious high-frequency Sloan generator now obsolete because of its complexity. In 1937 Dr. Richard Dresser of Harvard's Huntington Memorial Hospital in Boston began the first constant-potential x-ray treatments with the M.I.T. air-insulated electrostatic generator operating at slightly more than one million volts. This was followed by the Massachusetts General Hospital program in 1940, under Dr. George W. Holmes and now Dr. Laurence L. Robbins, using M.I.T.'s one-and-a-quarter-million-volt pressure-insulated generator. At the St. Bartholomew's Hospital in London clinical treatments were begun by Dr. Ralph Phillips in 1937 at 700 kilovolts, and the large transformer-rectifier apparatus was gradually improved to million-volt operation. The Memorial Hospital in New

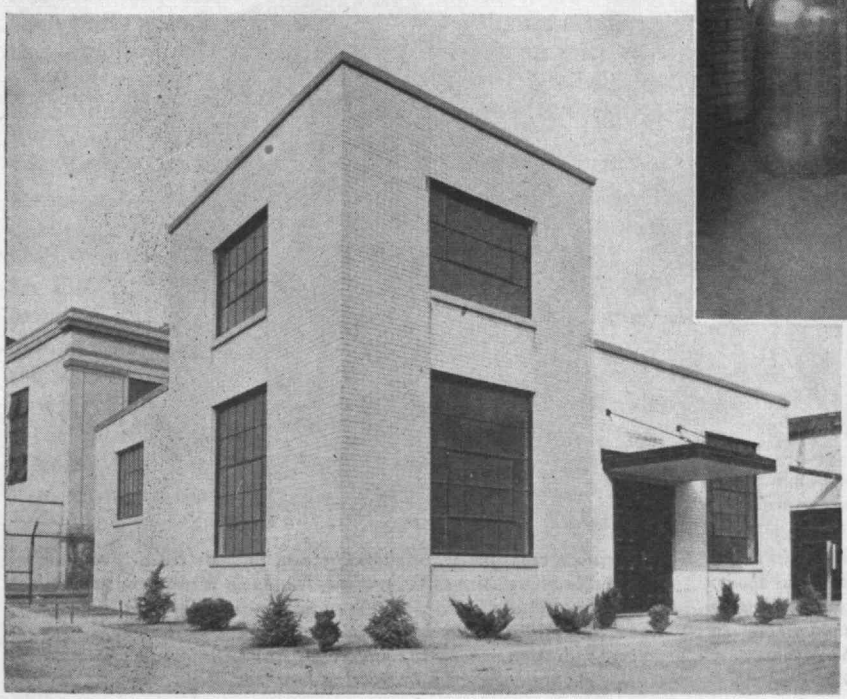
York has used General Electric's million-volt resonance transformer for x-ray therapy for about 10 years. In Norway, Dr. S. N. Bakke of the Municipal Hospital, Haukeland, Bergen, began treatments in 1942 with a one-and-a-half-million-volt air-insulated electrostatic generator designed by Odd Dahl, formerly of the Carnegie Institution of Washington. A number of other programs at intermediate voltages could be mentioned. All have reported with varying degrees of enthusiasm the observation that certain more favorable therapeutic reactions could definitely be ascribed to the higher voltages at which the x-rays were generated.

Radiation Therapy at Two and Three Million Volts

Since January, 1946, in a clinical therapy program under the medical direction of Dr. Richard Dresser, patients have been treated on the grounds of M.I.T. with roentgen radiation produced by an electrostatic research generator which can operate at well over three million volts. In the ensuing 18 months, complete treatment series were given to more than 150 selected patients. After interruption during the summer of 1947 this clinical program will be resumed with a larger clinic and improved, higher-voltage apparatus. Roentgen radiation produced by three million volts exceeds in quality the gamma rays from radium in equilibrium with its decay products. The output intensity of this therapeutic generator is several times greater than the combined radiation output of the entire world supply of this precious material. This roentgen-ray source operates at the highest voltages thus far clinically used in cancer therapy. The preliminary observations made in the course of the work have generally confirmed the physical evidence that roentgen rays of several million volts of energy are superior in certain important respects to the relatively low-energy radiation now in common use and even considerably better than the one-million-volt radiation investigated over the last decade. That extensive clinical research by many investigators will be required to exploit fully the therapeutic qualities of these high-energy radiations is also evident; several years of physical and clinical research will be needed to consolidate the benefits derived from higher voltages.

The supervoltage x-ray source located in a small building on Institute property near Vassar Street in Cambridge is a pressure-insulated electrostatic generator of the type first developed by Robert J. Van de Graaff. Designed by the electrical engineering group in 1940 for physical and medical research, it was applied during World War II to the irradiation of atomic pile materials with intense ionizing radiations and also served as a prototype for the electrostatic generators developed at M.I.T. for military radiography. Now, reapplied to peaceful pursuits, high priority is given to the daily medical program, but the unusual quality and quantity of ionizing radiation produced by this equipment is also of interest in other investigations. In a co-operative study with the Department of Food Technology, the biological and photochemical effects of both x-rays and cathode rays on micro-organisms and on food and drug products are being studied. In another aspect of this program the physical properties of these radiations and their action on nonliving matter are actively followed.





(Above): *The column and terminal structure of the three-million-volt generator at M.I.T. with its tank removed. This generator produces voltages over 10 times higher than the standard voltage for deep x-ray therapy. Its radiation output, more penetrating than gamma rays of radium, is equivalent to several times the total world supply of that precious material.*

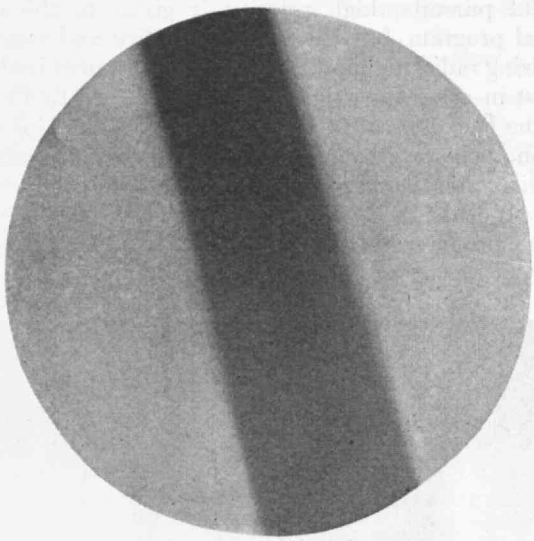
(Left): *Exterior of the Hyams Building which houses the three-million-volt x-ray and cathode-ray generator used in clinical research at M.I.T.*

An important therapeutic property of these supervoltage roentgen rays is the unusually high skin tolerance which almost completely eliminates skin damage in the treatment of deep tumors. In the past, x-ray therapy has suffered from the limitation that the radiation must enter through the relatively radiosensitive skin and undergo very considerable attenuation and misdirection by the absorption and scattering processes before it reaches the site of a deep tumor. Many of these difficulties are reduced by the skill of the radiologist in the choice of treatment distance, field size, number of portals through which the radiation is directed, and fractionation technique by which he distributes the total dose over a period of days or weeks. More often than not, however, in the present treatment of deep-seated malignancies, the tumor dose is established not by the optimum amount required to destroy the tumor, but rather by the tolerance of the surrounding normal tissue and skin through which the radiation must pass. Most deep tumors treated with 200-kilovolt radiation can be reduced, if at all, only by doses which produce a violent skin reaction and the absorption of sufficient ionizing energy by the patient to produce nausea and other physiological disturbances. In the clinical program at M.I.T. it was found that both of these difficulties have almost entirely disappeared. Doses have been delivered to the site of a deep tumor sufficient to cause its regression with only mild skin erythema or no skin reaction at all. Patients have been treated for abdominal tumors with little or no systemic reaction. Clearly the possibility has been developed for the first time of delivering to a deep tumor a dose defined primarily by the requirements at the tumor site rather than the tolerance of intervening tissue.

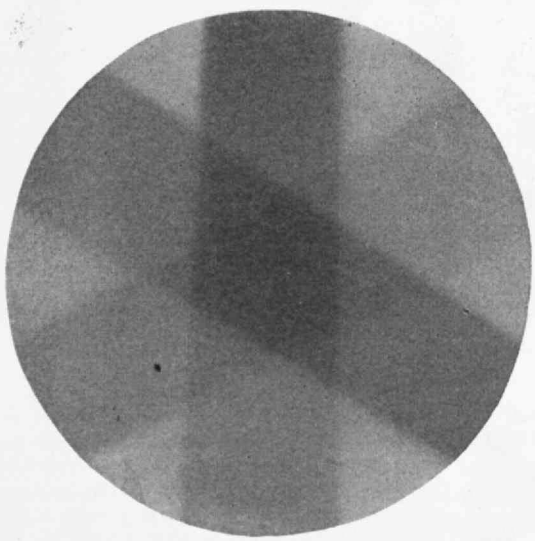
A second advantageous property for deep therapy of supervoltage roentgen rays is the substantial increase in penetration of the radiation beam. For a given dose sustained in the region of the skin, three-million-volt rays will deliver twice as much ionization energy to a tumor at a depth of 10 centimeters as will 200-kilovolt rays. As a result, deep tumors can be much more efficiently irradiated with less damage to surrounding healthy structures and less total ionizing energy absorbed within the body of the patient.

Radiologists have often employed the "cross-firing" technique as a means of delivering a high tumor dose with a minimum of external skin damage. In such procedure the tumor is irradiated from several directions so that the dose is cumulative in the tumor, but distributed

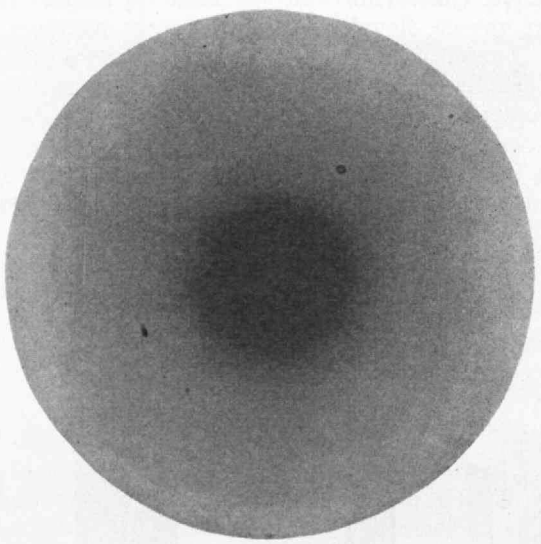
The three circular radiographs illustrate the technique of cross firing with one, three, and continuous-portal radiation, as described under each of the separate illustrations.



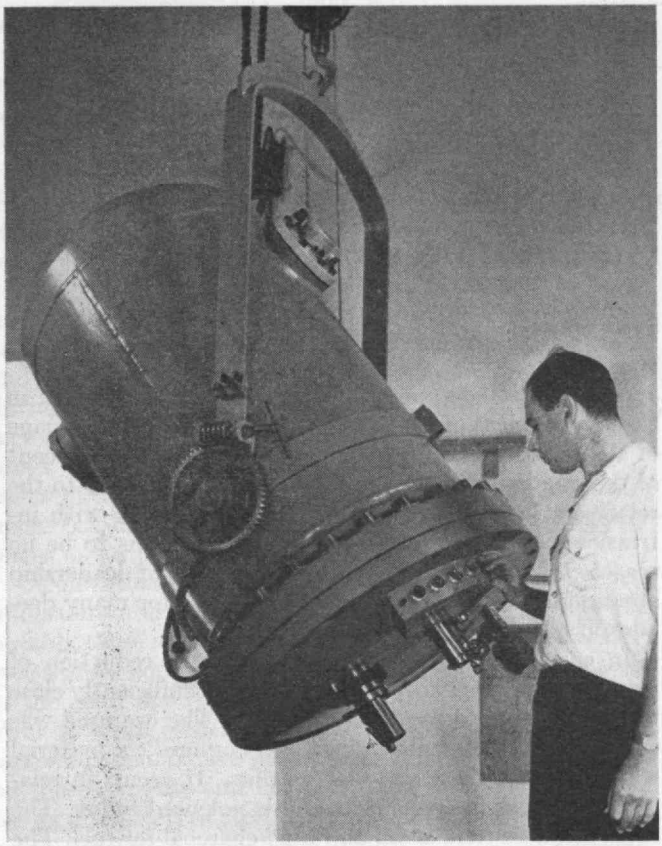
A two-million-volt beam of x-rays passing through a 20-centimeter cylinder of Masonite representing a phantom patient. In deep x-ray therapy the beam of radiation must enter through the skin and pass through the intervening healthy tissue before it reaches the tumor itself. Supervoltage x-rays produce relatively little reaction on the radiation-sensitive skin, and because of the higher penetration and lower scattering, are capable of delivering a higher dose to a deep tumor than can be achieved with lower-voltage x-rays.



Deep tumor doses can be augmented by cross-firing technique in which the radiation is directed at the tumor from several directions as shown by the dark strips. In the three-portal cross-firing technique the radiation is directed at the tumor from three different angles as shown here. In this case the tumor dose is 60 per cent higher than the highest dose sustained outside the selected tumor region.



Continuous cross firing, produced by continuously rotating the tumor-directed beam relative to the patient, results in a uniform tumor dose many times that sustained by the radiation-sensitive skin and several times that sustained by healthy tissue adjacent to the tumor. Supervoltage radiation, combined with cross-firing technique, makes possible high efficiency in treating localized deep tumors.



This supervoltage x-ray generator, the most compact machine thus far developed for cancer therapy, is comparable in size and flexibility of use to lower-voltage equipment now generally available. It was developed at M.I.T. under a grant by the American Oncologic Hospital which will use it in its program of deep therapy.

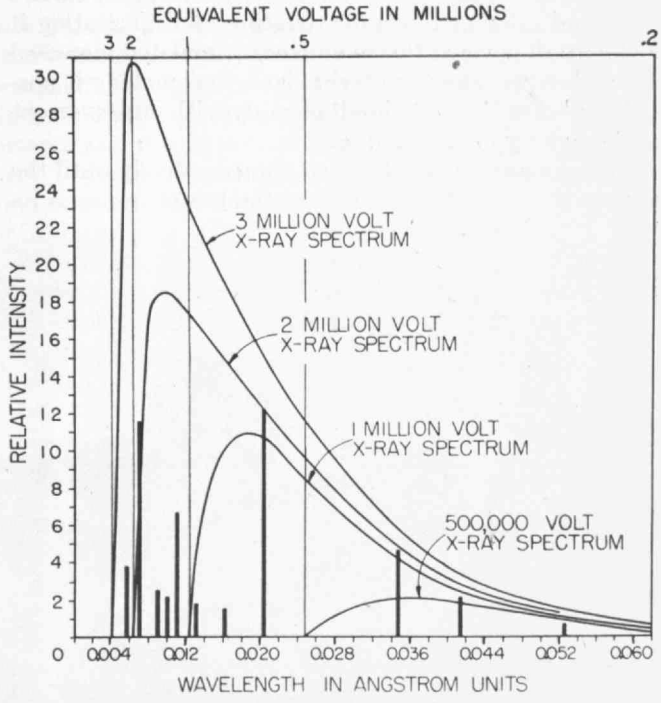
in the surrounding healthy tissue and skin. When this technique is likewise applied with supervoltages, unusual selectivity of radiation dose is accomplished. Cross-firing from three directions results in a deep tumor dose which is greater than the highest dose sustained elsewhere in the tissue. Using a continuous cross-firing technique with supervoltage rays, it becomes possible to deliver to a localized deep tumor dosages which are six times higher than those absorbed by even nearby healthy tissue. Thus the dream of the radiologist of delivering to arbitrarily selected regions deep within the body cell-destroying ionization far greater than that sustained in other regions becomes attainable.

Unfortunately the clinical problem is often more complicated. Deep-seated malignancies may not be well defined. Tumors of the bladder, uterus, larynx, and thorax are often localized, whereas other common cancer types are likely to have nearby or distant extensions from the primary tumor site. Metastasis from the primary tumor along the lymph nodes is a common characteristic which requires that these distributed regions of possible malignancy must be found and destroyed. The probable areas where metastasis might occur are often fairly definitely known from clinical experience so that preventive radiation therapy may be initiated even before symptoms appear. It is perhaps even more important to treat effectively the periphery of malignant regions and their actual or anticipated metastases than to concentrate on the primary tumor. Although this clinical problem is more complicated, the use of more penetrating, less scattering, and more skin-favoring supervoltage radiation, combined with real diagnostic and radiologic skill, should pay dividends in increased comfort and life of the patient.

High-Voltage Research at M.I.T.

The present medical work with supervoltage x-rays is an outgrowth of a development program for nuclear research which began at M.I.T. in 1932. At that time Robert J. Van de Graaff, then just removed from Princeton where he had developed the electrostatic principle of voltage generation for which he is acclaimed, was constructing the large air-insulated electrostatic generators at Round Hill, New Bedford, for nuclear research. Within the Department of Electrical Engineering investigations were beginning on the insulation of electrostatic generators in high vacuum and on the possibility of developing more compact sources of high constant potentials.

Today the original Round Hill generator, moved to a steel building on the Institute's property in Cambridge, is in continuous use in nuclear studies with electrons or positive ions of two-million-volts energy. The steady stream of charged particles produced by the electrostatic accelerator is homogeneous and accurately controllable in energy and free from extraneous background radiation. These characteristics are virtually indispensable in certain important precision studies of nuclear structure and are not attained in the cyclotron, betatron, synchrotron, or other indirect particle-accelerators which are inherently capable of far greater energies. A new compressed insulated generator (*Continued on page 122*)



When high-energy electrons are stopped on impact with a gold target, their kinetic energy is converted into penetrating electromagnetic radiation. The effect of increasing the voltage is to move the continuous x-ray spectrum in the direction of shorter wavelengths and to increase efficiency of x-ray production. The curves show that the spectrum of three-million-volt x-rays includes wavelengths shorter than those emitted by radium in equilibrium with its products, as shown by the line spectrum. Such radiation is, therefore, superior to radium in its penetrating, nonscattering properties.

How Long Will Our Metals Last?

The World's Supply of Metals, Definitely Not Inexhaustible, Can Be Prolonged by International Co-operation, Aided by Conservation and Research

By Carle R. Hayward

MANKIND had its Stone Age when it adapted this omnipresent material to various purposes in advancing the standards of living. Then came the Bronze Age in which easily reduced and fabricated nonferrous metals were used to replace stone and wood and for many new purposes. Thus civilization was still further advanced. Utilization of metals has increased as civilization progressed until some stocks show signs of early depletion and we may well ask, "How long will our metals last?" To answer this question we need to examine the uses to which metals have been put in the past, to survey our present consumption, and to extrapolate, as well as we can, into the future. We begin this survey with the most common metal — iron.

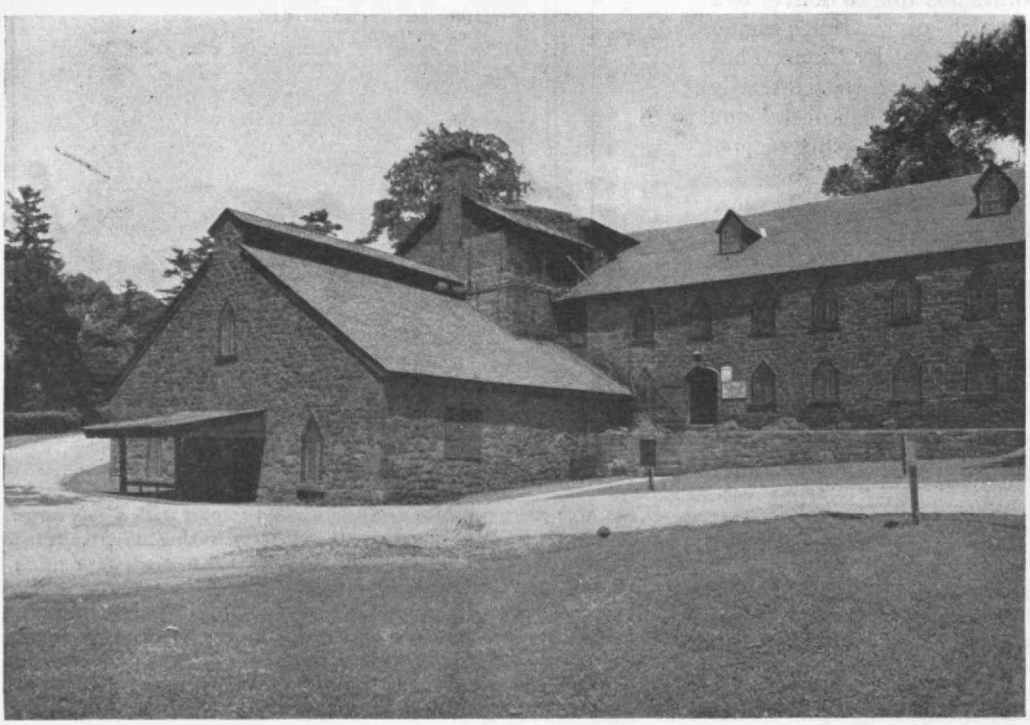
Iron is seldom found in the metallic state and then only in alloys of probable meteoric origin. Because it is less easy to reduce and fabricate than copper, it came into general use long after men had acquired crude metallurgical skill in reducing copper and other nonferrous metals.

Iron is one of the most abundant elements in the earth's crust and after methods for reducing and fabricating it had been discovered this abundance stimulated increased use and improvement in techniques, thus making it possible to lower the cost simultaneously with improvement in the quality of the product.

These improvements have continued actively until the present day with the result that the use of iron and its alloys has become one of the most important factors in the development of modern civilization. The total tonnage of all nonferrous metals combined is less than 10 per cent of the iron and steel tonnage. This is due primarily to the relatively low cost of iron and steel combined with intrinsically valuable properties and there seems to be no reason to believe that this wide margin of leadership among the metals will be seriously altered for many decades, if ever.

In early colonial times furnaces for the reduction of iron ore sprang up wherever ore occurred sufficiently close to a settlement to produce a demand. The ore used was commonly the limonite known as "bog ore"; a material which is low in iron and high in silica. It occurs in relatively small shallow deposits and is not used today. The early furnaces were small and used charcoal for fuel. The output per man-hour and per furnace day was small and the produce was impure; yet it played an important part in colonial economy. Among the active furnaces in the Massachusetts Bay Colony were those at Saugus and Braintree, and in the Plymouth Colony, at Bridgewater, but several others operated for a time.

The magnetite deposits along the Appalachian Range furnished a richer ore than the bog deposits and became important as colonization proceeded westward. Remains of some of these furnaces in various states of repair or restoration exist at several points. One of these at Corn-



This iron blast furnace at Cornwall, Pa., gives some idea of colonial facilities for producing metal. Built in 1742 and enlarged in 1845, the enlarged furnace had a capacity of 20 tons of iron per week when it ceased operation in 1883. Wing at right contains blowing engine; left wing covers casting floor. Furnace stack is in the center.

Photo, Bethlehem Steel Company

wall, Pa., which furnished metal to equip the Revolutionary forces of General Washington is especially well cared for. It was supplied with ore from a neighboring mine which is still being actively operated by its present owner, the Bethlehem Steel Company.

There is an interesting story about this mine which illustrates the difficulty in making accurate predictions regarding the life and development of mineral deposits. It seems that an early owner who considered the property inexhaustible gave a friend written permission to take from the mine enough ore to supply one furnace "as long as grass grows and water flows." Ownership of the mine and the written permission changed hands several times during the next 150 years and the size of the "one furnace" increased from five or six tons of product to over 100 times that figure. Successive owners of the mine made frequent attempts to buy off the successive owners of the paper but it was not until about 1930 that they came to terms and a cause of serious friction was removed.

Colonization moved westward and in due course other important iron deposits were discovered and developed, notably those in Michigan, Minnesota, and Alabama. The vicissitudes connected with the discovery and exploiting of the great deposits of Minnesota are well described by Paul de Kruif in *Seven Iron Men.*[1] Two great wars and increasing demands of industry have made heavy inroads on these deposits and lines of worry are evident on the brows of officials of steel companies which are dependent on them. Attention is being turned to areas in Canada contiguous to the mines in the United States and properties in Cuba, South America, and Africa are becoming of increasing interest.

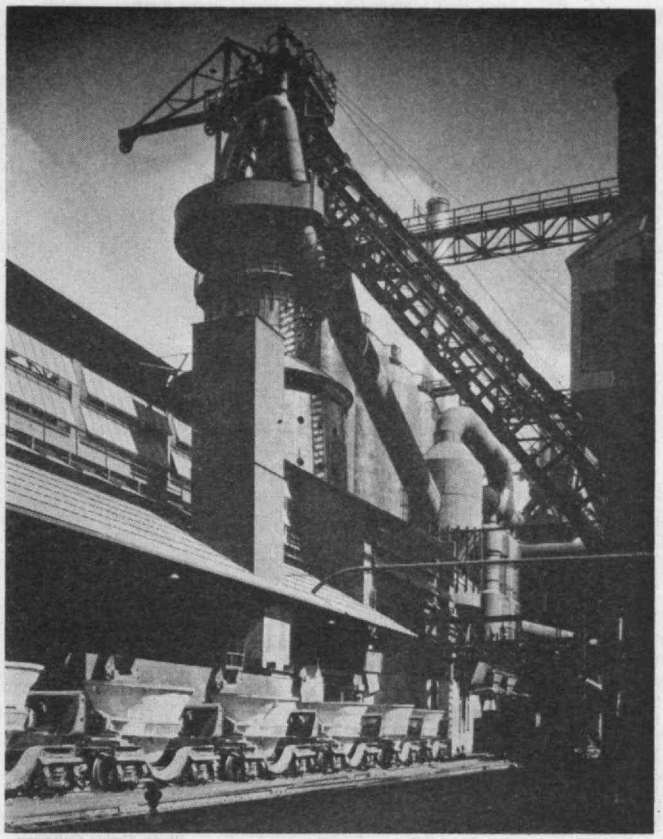
Many predictions have been made regarding the probable life of the Michigan and Minnesota mines which supply such a large part of the needs of this country. Some writers, in panic, say the best ore will be all gone in less than 25 years and others more optimistically double the figure but all agree that the high-grade ore will be completely exhausted in the lifetime of men now living. This is something of vital interest to every inhabitant of the country. Where can we get more iron ore and what if anything can we do to prolong the life of our deposits?

As stated above, several United States companies are acquiring interests in, and actively developing, foreign mines but even these will supply our needs for high-grade ore for only a generation or two. We must not forget however that modern methods for geophysical prospecting, assisted by the use of helicopters to land parties in regions of the earth hitherto nearly inaccessible, may bring about discoveries of iron ore and other mineral deposits in places where they have not been suspected.

The above statement may be discarded by some as mere wishful thinking so it is well to consider other solutions to the problem.

The great hope of the world in extending the life of mineral deposits lies in the field of mineral dressing. The late Professor Robert H. Richards, '68, was a pioneer in this field. At his own expense he carried out extensive fundamental research in the gravity concentration of minerals and his published results were eagerly studied by workers in other laboratories. Men trained in ore concentration at M.I.T. made their mark in many parts of this and other countries. Concentration by flotation was just coming on the scene as Richards was passing off and it has

[1] New York: Harcourt, Brace and Company, 1929, $3.00.



Photo, Kurt Severin of Black Star

Contrasted to the blast furnace on the opposite page is this modern Goliath of the Ford Motor Company whose output dwindles to insignificance the production of 20 tons per week achieved by the Cornwall furnace.

now become the most important method for the concentration and separation of minerals. As the fundamental scientific laws governing it are becoming more fully understood, the selectivity of the operations is being improved, and this in turn makes it possible to start with a very low-grade ore and produce economically a high-grade concentrate which can easily be converted to metal or into uses as a valuable nonmetallic material.

Mineral dressing grew up at M.I.T. in the Mining Engineering Department and was happily retained when this Department was abolished. It is still functioning energetically, principally in the field of flotation, under the direction of Dr. Antoine M. Gaudin.

As one example of what mineral dressing can do, reference will again be made to the Cornwall mine in Pennsylvania. The early operators were bothered by the presence of sulfur and copper in this ore and since the iron was in the form of magnetite a continuous method was first developed for separating the magnetic iron mineral from nonmagnetic sulfide and silicate minerals. Partly with the advice and help of Professor Richards and other M.I.T. graduates the nonmagnetic product was separated into a marketable copper-bearing sulfide product and siliceous waste. Later when development of flotation made the separation of sulfide minerals practicable a further separation was made of the copper mineral chalcopyrite from the iron sulfide, pyrite. It was then found that cobalt, which was known to be present as a small fraction of one per cent in the ore, was all carried by the pyrite and a process was developed for extracting it profitably from this cobalt-enriched product.

The Cornwall ore is a special case but mineral dressing



Photo, Ewing Galloway

Plying the Great Lakes with their valuable cargo of iron ore are freighters, such as that shown here, with hatches especially constructed to load and unload ore quickly.

in various combinations of the older gravity and magnetic methods with constantly improving flotation procedures is being increasingly used to treat low-grade iron ores and make a product suitable for blast furnace smelting.

Although it is possible for a blast furnace to smelt a relatively low-grade ore and produce a small amount of good pig iron it is obvious that as long as high-grade (above 50 per cent iron) material is available, giving a larger iron output per furnace day, the low-grade material cannot be treated economically in comparison with it. Enormous amounts of low-grade material are available and it is fair to predict that with the help of mineral dressing the blast furnace plants can be supplied with high-grade concentrates long after the natural high-grade deposits are exhausted.

If the time comes when the blast furnace operators cannot get the kind of material they now think necessary, they can use a lower grade raw material and still give us iron but at slightly higher cost based on present knowledge. It is not unreasonable to hope and expect, however, that improvements in methods for converting ore to steel will make a contribution to the extension of our iron resources by cutting smelting costs. The use of cheap oxygen[2] may well have an important effect in making this possible.

A further combination of factors has had continuing influence on the conservation of iron resources and its influence may become more pronounced in the future. Reference is made to increasing knowledge of the structure of steel and how to bring about, by alloying and heat treatment, the properties desired. Testing the strength of materials and increased knowledge of the causes of failure also come into the picture and it is now possible to specify accurately the kind of material and the shape and cross sections of a steel member for almost any structure.

To illustrate the above fact attention is called to the first Brooklyn Bridge.[3] In this case, lack of knowledge of strength of materials and bridge design required the use of factors of safety so large that many decades later the bridge was able to bear a weight of traffic wholly undreamed of at the time it was built. This may have proved to be a blessing in disguise but shows how conditions have changed.

A further factor in conserving our iron resources is the increasing care used to minimize corrosion. We are continually hearing more about the causes of corrosion and are developing methods for reducing its ravages. The life of iron and steel structures is thus prolonged and the amount of the original structure finally returned to be reworked as scrap is considerably increased.

The International Nickel Company reports that a building had an ornamental spire 16 feet high and weighing 8,000 pounds made of ordinary carbon steel. After serious corrosion it was replaced by a stainless steel spire weighing 1,000 pounds.

One factor in keeping down the cost of iron and steel is worthy of mention. This is the mechanical handling of materials from mine to finished product. Long trains of hopper bottom cars are loaded by great steam or electric shovels in the open cut mines of Minnesota, drawn to specially constructed ore docks from which specially designed boats are quickly loaded by gravity. After passing through the lakes the boats are quickly emptied by specially designed buckets of large capacity which discharge on ore docks at a blast-furnace plant or into cars for transportation overland.

At the furnace plants the greatest engineering skill has been devoted to the design of equipment and its efficient operation, all of which is reflected in the final cost of finished product.

The inevitable conclusion to be drawn regarding iron is that it will continue to be the most widely used of the metals even though, for some purposes, it may be replaced on a competitive basis by other materials.

Copper

Copper is the most widely used of the nonferrous metals. It is exceeded only by silver in electrical conductivity and for this reason its principal use is in the electrical industry. It is also the principal constituent in such widely used industrial alloys as brass and bronze. Its high resistance to atmospheric corrosion results in important uses in the building industry.

For more than 60 years the United States has been the world's leading copper producer. In 1929 it produced nearly one half of the world output, and nearly half of the United States production came from the state of Arizona. The great mines of Michigan, where the copper uniquely occurs wholly in the metallic state, are nearing exhaustion and other former great producers, such as the United Verde mines of Arizona and various other great mines are either closed or about to close. There has been some concern over the depletion of the ore at Butte, Mont., known

[2] Stevenson, Earl P., "Oxygen for Industry," The Technology Review, November, 1947, p. 32.

[3] Cameron, Edward H., "High Road to Brooklyn," The Technology Review, May, 1946, p. 419; June, 1946, p. 487.

as "the richest hill on earth" but the president of the Anaconda Copper Mining Company has recently announced that intensive exploration, coupled with improved mining and concentration methods, will extend the life of the deposit for many years. The development of new properties and improvement in extraction techniques have thus far kept the United States self-sustaining but it may not remain long in that class.

Mineral dressing has thus far been even more important in the copper industry than it has in the iron and steel industry. In fact the cost of copper would be prohibitive without it. It has made possible the development of such mines as that of the Utah Copper Company near Salt Lake City where, at peak production, more than 80,000 tons of ore are mined per day and in the process of treatment it is all crushed to about the fineness of table salt. This ore contains only one per cent of copper yet the operations have been so skillfully developed and integrated that the mine has been highly profitable and the flotation mills have sent the smelter a very satisfactory, economical concentrate.

For many years it was considered that ore with a copper content of about one per cent was as low as could be mined and treated at a profit. Copper prices are now higher and efficiency of treatment is also higher. There is a probability that a very large deposit containing only 0.8 per cent copper will be opened up soon — which is another illustration of how available resources are expanded as technical skill increases and an advance in price stimulates production.

The cost of producing copper was kept low for 25 years in the face of many factors which tended to increase it by raising the capacity of the furnaces used for smelting copper concentrates without greatly changing their major dimensions. The huge demand for copper in World War I stimulated changes in furnace design and firing technique which doubled the copper output. In the 1920's improvement in concentration methods gave the furnace operators a charge with about twice the copper content it formerly had and further improvements in furnace operation have increased smelting rates so that today, with no change in size, a furnace can turn out about five times as much copper as it could produce under conditions existing in 1915 with but little more labor and fuel.

In all this progress M.I.T. men have played an important role. The rapid spread of the Institute's fame throughout the West and into foreign countries, particularly in the early days of its history, was due in no small degree to its graduates in mining and metallurgy who went pioneering into remote places. In more recent years, even with increasing competition from other excellent schools, the accomplishments of M.I.T. Alumni have continued to be highly creditable.

Although the United States may soon cease to be self-sustaining in copper the world outlook is not too alarming. The situation is, however, less satisfactory than is the case with iron and the time is not far distant when demand will begin to exceed supply and prices will rise. If no new sources become available to keep prices down, various substitutes will come increasingly into use. The most promising competitor of copper is aluminum.

Aluminum

Aluminum is one of the most abundant materials in the earth's crust, estimates making it slightly greater than iron by weight. Also, like iron, considerable quantities



Photo, Kennecott Copper Company

A modern electric shovel replaces the man power of earlier days in loading flat cars in a copper mine in Nevada. In one bite the shovel accomplishes as much as a score of men.

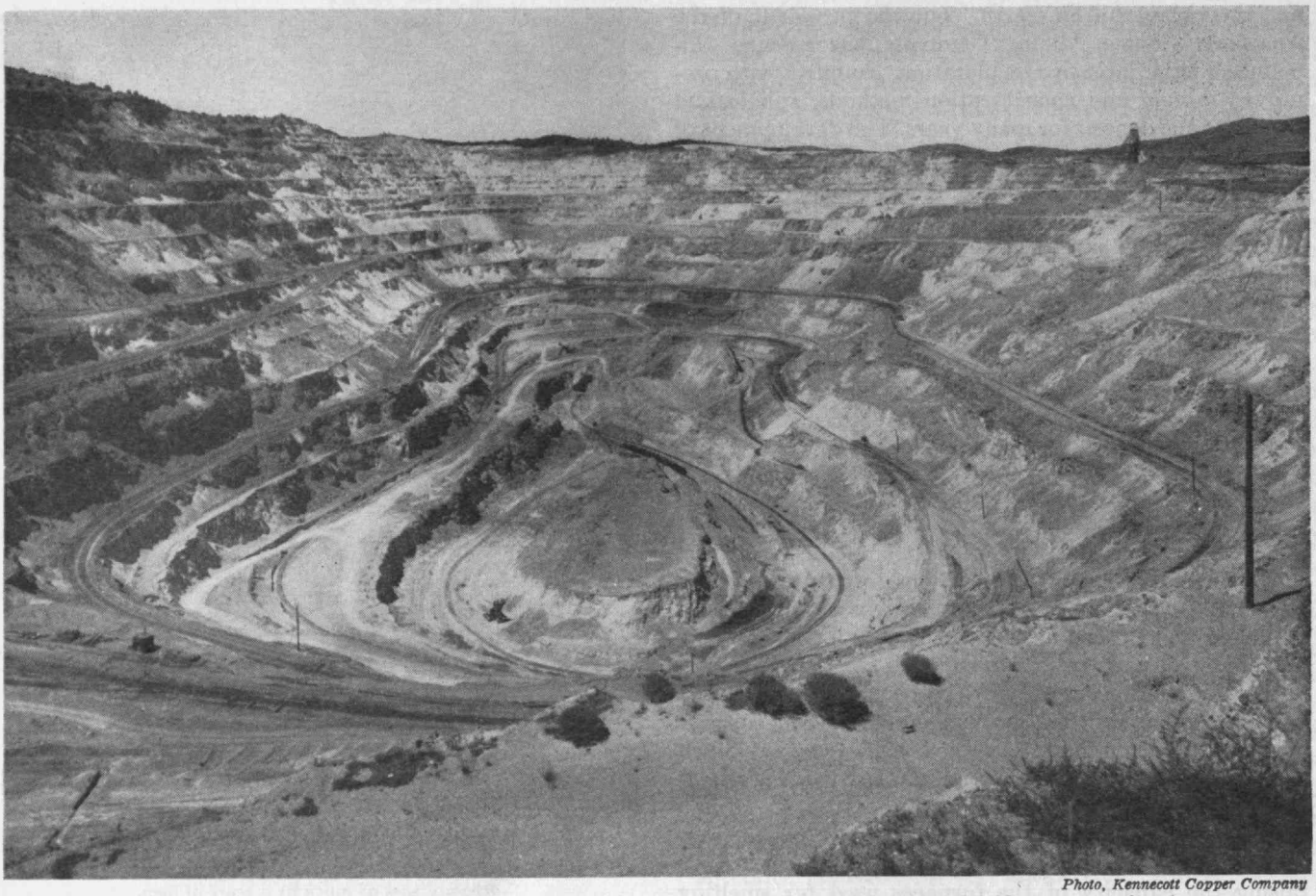
exist as relatively high-grade oxide deposits with an abundance of lower-grade oxides and complex silicates.

Up to the present time only one process has been developed for producing metallic aluminum from its ores. This process involves two steps, the first of which has for its objective the production of substantially pure aluminum oxide, and the second the reduction of the purified oxide to metal. The only commercially successful reduction process requires large quantities of electric power to electrolyze the metal from a bath of fused fluorides in which the aluminum oxide has been dissolved.

Lower power costs, improved processes for producing purified oxides, the increase in demand, improved techniques, and the growth of some competition in the industry have all combined to gradually cut the cost of producing aluminum until today it sells for little more than half the price which obtained 20 years ago. An abundance of low-grade, raw material is available and will ultimately be used but at present it is more economical to use the more easily worked high-grade ores.

Aluminum is a versatile metal and its use is rapidly expanding. Some plants are now fabricating it into structural members and sheets on a scale comparable with that used in steel plants and the saving in fabricating costs thus achieved has made aluminum attractive for many purposes. Its intrinsic lightness is causing it to be specified in preference to steel and other metals in vehicles and for certain uses in the building industry.

Regardless of improvements and new discoveries in reducing metals from ores there are fundamental reasons why it is only in cases where its special properties outweigh the initial cost that aluminum will replace steel.



Photo, Kennecott Copper Company

Mining operations at the Ruth Copper Mine in Nevada bear a peculiar likeness to the terraced fields in contour farming.

Magnesium

The use of magnesium had been slowly increasing between World War I and World War II but it was distinctly a minor metal used only where its extreme lightness made it attractive. Its mechanical properties in the pure state are not all that could be desired and only a few alloys have thus far been developed which are as desirable as some of the aluminum alloys. However, the production of magnesium and its alloys had a phenomenal growth during World War II for two general uses, namely, incendiary bombs and aircraft parts. Since the war the first use has stopped and the second has been greatly curtailed.

No long distance survey of metals can ignore the potential possibilities of magnesium. It is the lightest of the more abundant metals and the world is definitely becoming light-metal conscious. Lightness is a distinct asset, especially when a body is to be propelled at high speed. When magnesium and its alloys have received the benefit of as much research as has been lavished on aluminum, it is highly probable that their properties will be greatly improved and their uses expanded.

In evaluating the future of magnesium, attention should be called to the fact that considerable quantities have been produced economically from sea water. Regardless of size, therefore, every country in the world with a sea coast has a never failing source of magnesium. If such countries have also a large and cheap source of electric power they can produce the metal in unlimited quantities. This fact may become of great importance as time brings a partial exhaustion of other metals.

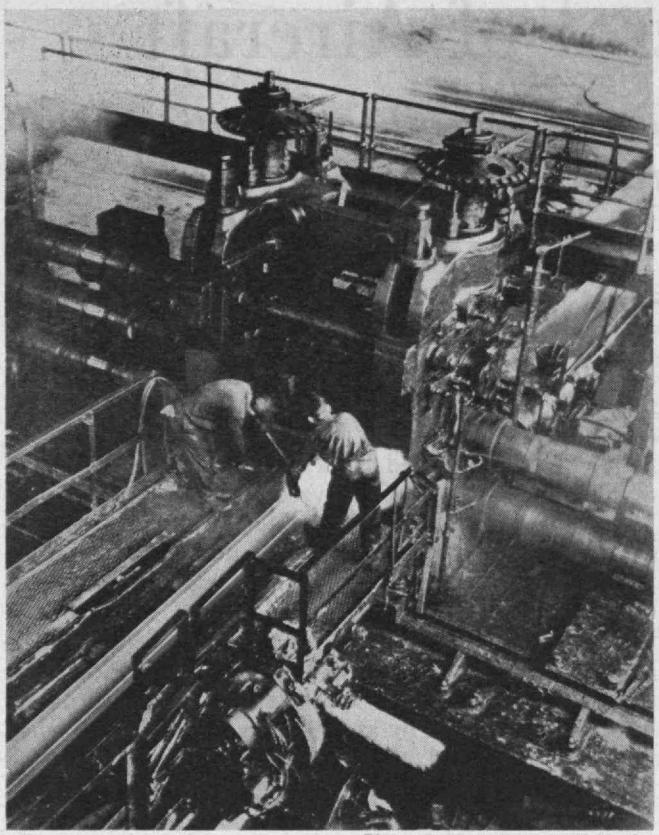
Just as aluminum is making a place for itself in world economy, because of its specific gravity, so it is reasonable to believe that magnesium, because of its even lower specific gravity and the ready availability of raw material, will be a metal to watch.

Lead

We will now jump from magnesium, the lightest of the common metals, and the most recent to come into large use, to lead which is the heaviest of the common metals and one which has been used extensively since the dawn of civilization.

The outlook for our lead resources is not good. No important new lead mines have been reported for any part of the world for many years and our old deposits are becoming sadly depleted. The United States has been leading all other countries in lead production for many years and we are fortunate in having nearby in Canada and Mexico two other large producers. Another large producer is Australia.

The principal uses of lead are for wet storage batteries, cable covering, pigments and in antiknock gasoline. The general situation became critical in the 1920's when the automotive industry was rapidly expanding and requiring increasing numbers of batteries, and the electrical industry was expanding and requiring more cables. The development of differential flotation greatly enhanced the production of lead concentrates from complex and hitherto economically unworkable ores and consumption was slowed during the depression. Strange to say, the demand for lead during the war, unlike that for many other metals,



Photo, Aluminum Company of America

The men are rolling a 12-inch aluminum channel in this three-high, 26-inch structural shape mill.

was not greatly accelerated but normal depletion has nevertheless continued to have a serious effect.

New deposits may be found and developed in the future but it is not safe to depend on it. We should study the uses of lead and curtail its use for purposes where it is finally wasted if we are to continue to have what we need for essential purposes.

Titanium oxide is rapidly coming to the front as an excellent substitute for lead in the paint industry and considerable quantities of zinc are also used. It is probable that if necessity demanded it, the versatile oil industry could find a substitute for lead as an antiknock agent.

Fortunately the lead used for battery plates is, to a considerable extent, recovered for re-use when worn-out plates are resmelted. To a lesser degree, the same is true of cable covering and to a much lesser extent in solder.

Considerable quantities of miscellaneous lead scrap are also recirculated and type metal is continually re-used with little deterioration. All these factors contribute to prolong the life of our lead deposits so if permanent wastage can be minimized the general outlook should be very greatly improved.

Zinc

Zinc is another of the major nonferrous metals, and, as in the case of the metals previously mentioned, the United States is the world's leading producer. It has numerous uses but the principal ones are in galvanizing iron and steel and as a constituent of brass. The development of differential flotation has an even greater effect on the output of zinc concentrates than it did with copper and lead. There was actually an overproduction in the late 1920's but the industry has leveled off and producers are looking with some apprehension at our diminishing resources. Formerly, large amounts of zinc were wasted in discarded slags produced in lead smelting. It is now becoming common practice to give the molten slag a further treatment in order to fume off and recover the zinc and incidentally most of the occluded lead which would otherwise be lost.

Although tin and cadmium are both used for coating iron and steel, the amounts so used are but a small fraction of the amount of zinc used for this purpose. Paints and other organic substances can be used to minimize corrosion but it would be difficult to find anything as satisfactory as zinc. It would be unfortunate if a world shortage should develop which would make zinc too expensive to use for this purpose. There is no immediate prospect of this happening but the life of known zinc properties is measurable in decades rather than centuries.

Precious and Minor Metals

The remaining metals which find a place in modern life are usually classed by the metallurgist under the two headings "precious metals" and "minor metals." The precious metals are gold, silver, and the platinum group. Compared with other metals they are scarce and costly.

Although gold resists atmospheric corrosion and acid attack, it is an interesting and highly important fact that it dissolves readily in cold water containing less than 0.1 per cent of sodium or potassium cyanide. This fact makes it possible to dissolve and recover gold profitably from finely crushed rock — a ton of which may contain only 0.1 ounce of gold.

The greatest use of gold for several hundred years has been as a basis for national currency throughout the world. Even though the gold standard has been legally abolished, gold is still looked to as a medium for settling international debts and thus retains its old status.

Tin is one of the well-known metals which has been found thus far only in insignificant amounts within continental United States. The most important source is in Southeast China and regions around the Malay Peninsula. The second important producer is Bolivia. Increasing amounts are also coming out of Africa. Production of tin is less than one-tenth that of copper.

The greatest uses for tin are for coating steel and for alloys, such as solder and bearing metal. Most of the coated steel is used for food containers and in spite of considerable research nothing as satisfactory for this purpose has thus far been found. Even so, if no tin were available or if the price becomes too high, certain lacquers will come in as substitutes. Electroplating processes for tinning steel were developed during the late war[4] which combined with subsequent annealing to seal minute breaks in the surface made it possible to produce satisfactory coatings with less than half the former weight of tin. This had an important effect in conserving our tin supply. A considerable recovery of tin is made from scrap-bearing metal and some by sweating solder from scrap-soldered materials. A minor recovery is also made by dissolving tin from scrap tin plates.

Nickel is another metal which is found to only a negligible extent in the United States ore deposits. Fortunately, however, the largest known deposit is located in the Canadian province of Ontario so our needs are easily supplied. The great use of nickel is in alloy steels where it improves the properties for (*Continued on page 116*)

[4] Whetzel, J. C., "Face Lifting for Tin Cans," The Technology Review, November, 1946, p. 37.

Automatic Control of Aircraft

Increased Reliability of Flying under All Weather Conditions and Reduction of Fatigue of Operating Personnel Are Some Features which Automatic Control Makes Possible

By Robert C. Seamans, Jr.

NEWSPAPER headlines recently recorded the first successful transatlantic round-trip flight of an airplane automatically controlled from the ground and sea stations. With many competent human pilots available, we may well ask what possible justification there may be for the huge expenditure of time and money which was required to accomplish this feat.

If we were to inspect a modern air liner, we would find the forward compartment of the airplane, used by the crew, to be an exceedingly complex aggregation of instruments and controls. Some of this complexity is to be expected for the flying of an airplane in three-dimensional space is much more involved than driving an automobile on what is essentially a two-dimensional plane. In front of the pilot's seat is a contrivance similar to the steering wheel of an automobile, except that it is mounted on an articulated column so that it can be rotated as well as pushed back and forth. The operation of this control wheel must be co-ordinated with the movement of foot pedals which control the rudder. In addition to the steering mechanism, there are perhaps 150 different buttons, switches, levers, and knobs, the proper operation of which constitutes a never ending challenge to the pilot's ability and skill. A button must be pressed when communicating with the airport tower for landing instructions. Landing lights must be switched on for a night approach. Levers are used to lower the landing gear and wing flaps. Throttles regulate the power output from the motors. So much detail is encountered in the flight of an airplane that a complete discussion of the many possible flight operations would fill a standard textbook.

The aircraft instruments, which are mounted in array on a panel in front of the pilot's control wheel, provide indispensable information for intelligent operation of the aircraft. Tachometers and other engine instruments are required, in addition to instruments for navigation, such as the magnetic compass, the artificial horizon, the altimeter, and the air-speed meter. The readings of more than 50 instruments must be analyzed by the pilot.

The difficulty of properly manipulating this complicated air-borne mechanism is accentuated by the speed with which significant events take place. Instrument observations must be made quickly, and there is little time for decision before effecting the correct control. The greater the accent on speed, the more difficult becomes the flying of an airplane. The latest jet fighter planes have been known to fly at 650 miles per hour, and when flying at this speed, the fighters travel the length of a football field in about one-third of a second.

The task of flying an aircraft for long periods of time has become too exhausting for one man. Today each commercial aircraft has a copilot to spell the pilot at intervals during the flight. A navigator equipped with all manner of celestial and radio aids informs the pilot of the correct course on long trips. A fourth member of the crew, the flight engineer, is important in all aircraft using four engines or more. He watches the fuel consumption, makes corrections necessary to account for unexpected head winds, and recommends the speed and altitude for optimum cruising conditions. Thus a system of checks and balances is established — with copilot, navigator, and flight engineer acting as a council for the pilot.

Even with a competent crew assisting the pilot, the reports of many recent accidents show that the proper operation of a modern airplane can demand more than human attention is capable of delivering. To help in this situation, special equipment is already in use, such as controls for holding engine speeds constant, and mech-

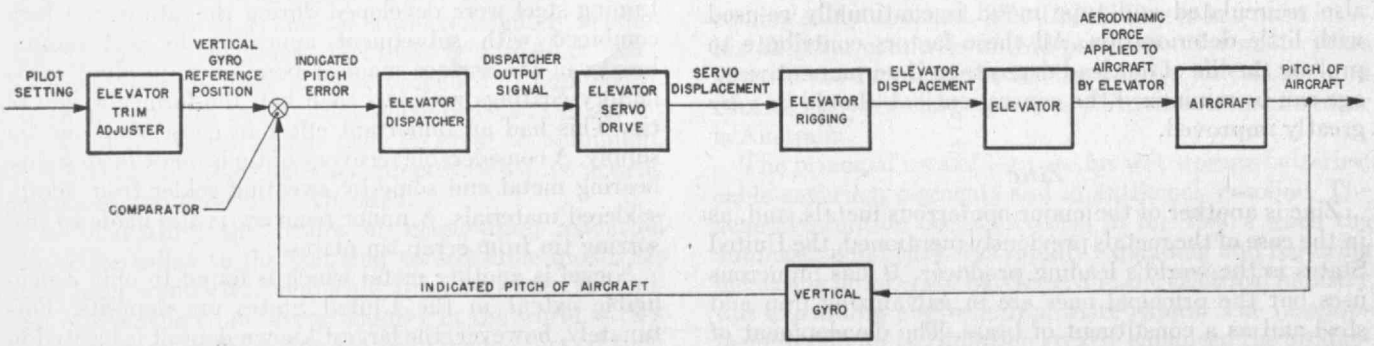
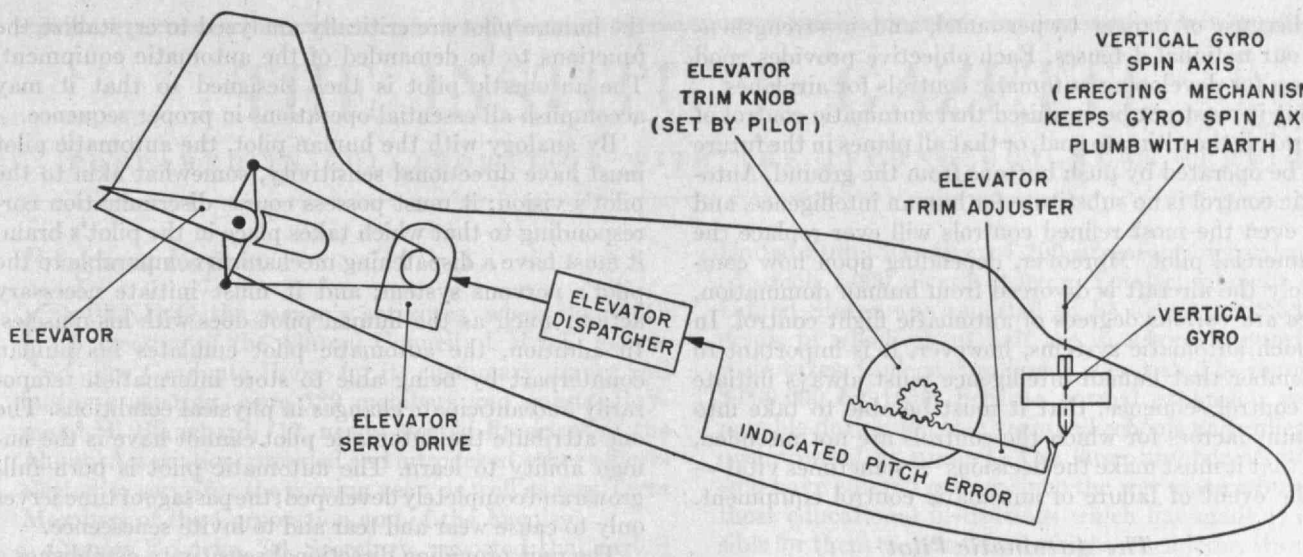
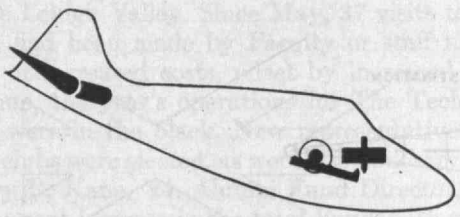


Fig. 1. Block diagram of functional elements in the automatic control of pitch of an airplane. The elevator trim adjuster enables the pilot to select a given elevation at which the plane will fly. The vertical gyroscope provides a directional reference standard against which the pitch of the aircraft may be compared. The difference between these two quantities, called the indicated pitch error, is the physical energy which is converted into a signal by the elevator dispatcher and which operates the elevator to bring the aircraft back on its predetermined pitch.



CONDITION 1 SHOWS THE AIRPLANE AFTER A GUST HAS FORCED ITS NOSE DOWN. AT THIS INSTANT AN INDICATED PITCH ERROR EXISTS BUT THE SERVO DRIVE HAS NOT HAD TIME TO DISPLACE THE ELEVATOR.



CONDITION 2 SHOWS THE AIRPLANE STILL IN A NOSE DOWN POSITION. THE ELEVATOR IS DISPLACED UPWARD BY THE SERVO DRIVE IN ORDER TO ROTATE THE AIRPLANE ABOUT ITS PITCH AXIS.



CONDITION 3 SHOWS THAT WHEN THE AIRPLANE IS AGAIN LEVEL, THE INDICATED PITCH ERROR IS MINIMIZED AND THE ELEVATOR IS BACK IN ITS NEUTRAL POSITION.

Fig. 2. Application of the closed loop diagram of Fig. 1 to the physical components of an airplane. The erecting mechanism of the vertical gyro maintains the gyro perpendicular to the earth's surface. Operation is indicated in the lettering on the diagram.

anisms to maintain constant the air pressure within the cabin. The most exacting equipment is used to direct the flight path of the airplane. This equipment automatically controls the heading of the aircraft and, while it is engaged, the pilot needs only to monitor the flight by the use of various instruments provided for this purpose. To maintain the intended direction of flight, the automatic control equipment must be able to detect divergence from the desired flight path and to actuate the control surfaces so as to minimize and correct for such divergence.

Weather is currently the bugaboo of both the air lines and the traveling public. The air lines are caught squarely on the horns of a dilemma, with the risk of accident counterbalanced by the need for revenue. The traveling public must gamble time saved in transit against time spent in a sit-down marathon in an air-line waiting room — in the latter event perhaps reinterpreting the fable of the tortoise and the hare. The full benefits will not be obtained from automatic control until additional refinements in design provide reliable all-weather flying. We may be confident that automatic control equipment will some day guide commercial airplanes through fog and snow as unerringly as a railroad track guides a train — but such a happy circumstance is for the future to fulfill.

Automatic control also makes possible certain special applications of aircraft in which any reasonable man would gladly forfeit his right to serve as pilot. When flying the newer type of aircraft near the velocity of sound, the pilot is risking his life on an engineer's extrapolation of current knowledge. The element of personal risk may be greatly reduced in such cases through the use of automatic control of aircraft, combined with remote-control devices which make possible the flying of newly designed aircraft from the ground or from other aircraft.

Another application in which a pilot will gladly relinquish control of aircraft to mechanisms, and in which the machine is superior to the man, is that of military target interception. In the future, a kamikaze will be outguessed by automatically controlled interceptors, which are far more accurate and deadly than any device relying alone on human perception and operation. A thermally or electrically sensitive seeker on the interceptor will sense the presence and position of the attacker; a computer will estimate the proper course for the pilotless aircraft, and servomechanisms will control the wing and tail surfaces of the interceptor in order that it may be able to intercept the attacker.

It becomes clear, then, that automatic control of aircraft is an important development in reducing fatigue and exhaustion of operating personnel, in increasing the reliability of flying in all kinds of weather, in opening up new uses for aircraft which would not otherwise be feasi-

ble because of danger to personnel, and in strengthening our national defenses. Each objective provides good reason for developing automatic controls for airplanes.

But it must not be surmised that automatic control of aircraft is the ultimate goal, or that all planes in the future will be operated by push buttons from the ground. Automatic control is no substitute for human intelligence, and not even the most refined controls will ever replace the commercial pilot. Moreover, depending upon how completely the aircraft is divorced from human domination, there are various degrees of automatic flight control. In all such automatic systems, however, it is important to remember that human intelligence must always initiate the control sequence, that it must be able to take into account factors for which the controls are not intended, and that it must make the decisions — sometimes vital — in the event of failure of automatic control equipment.

The Automatic Pilot

The design of an automatic pilot involves no witchcraft; rather it is merely one example (if an elaborate one) of principles which have long been known. The actions of the human pilot are critically analyzed to crystallize the functions to be demanded of the automatic equipment. The automatic pilot is then designed so that it may accomplish all essential operations in proper sequence.

By analogy with the human pilot, the automatic pilot must have directional sensitivity, somewhat akin to the pilot's vision; it must possess course discrimination corresponding to that which takes place in the pilot's brain; it must have a dispatching mechanism comparable to the pilot's nervous system; and it must initiate necessary action, much as the human pilot does with his muscles. In addition, the automatic pilot emulates his human counterpart by being able to store information temporarily and anticipate changes in physical conditions. The one attribute the automatic pilot cannot have is the human ability to learn. The automatic pilot is born full-grown and completely developed; the passage of time serves only to cause wear and tear and to invite senescence.

The unit providing directional sensitivity establishes a standard or reference direction which remains fixed with respect to the earth and is, of course, independent of the operation of the airplane. *(Continued on page 108)*

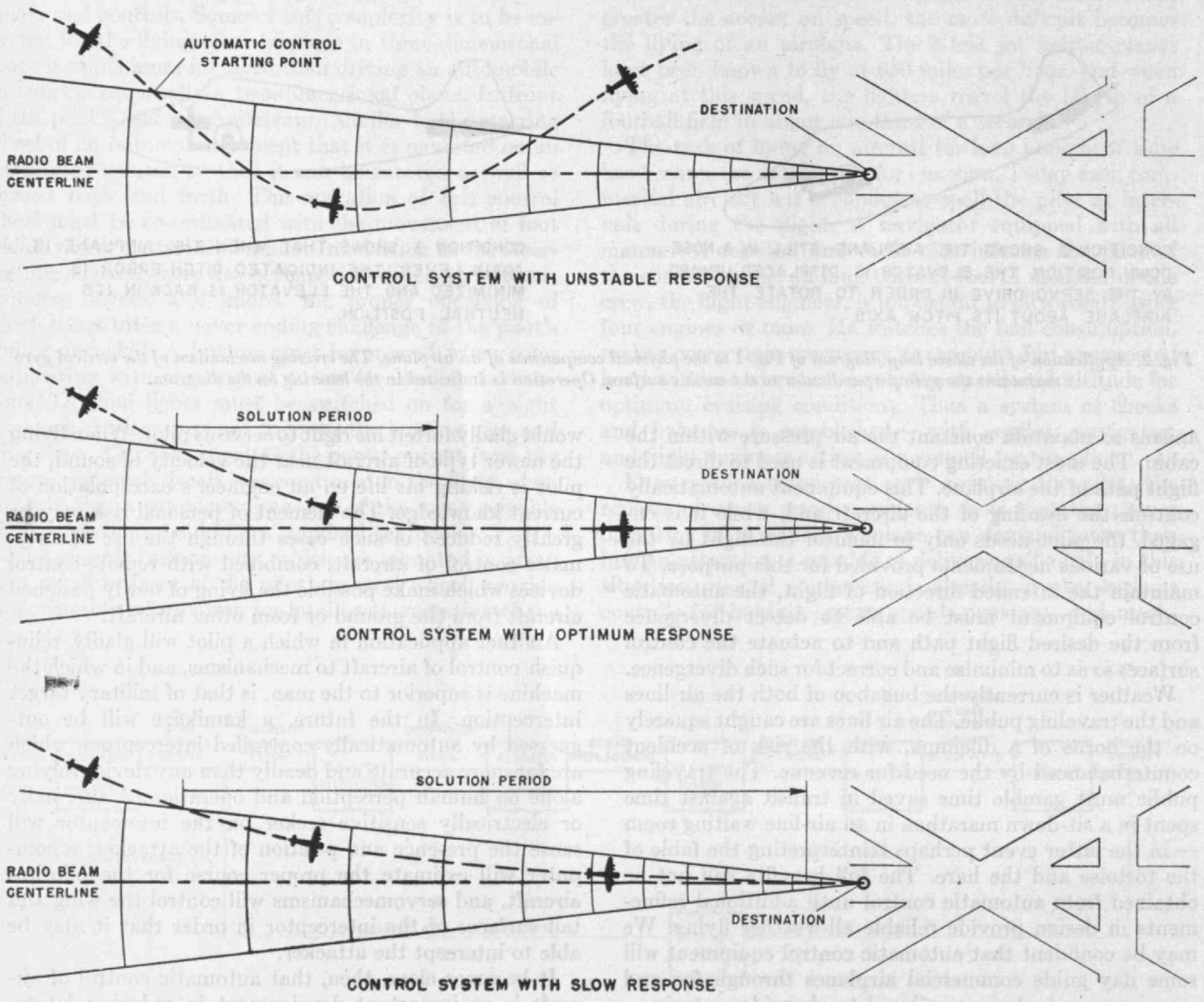


Fig. 3. Path of airplane in approaching landing field under automatic radio control for three different conditions of response. In the top diagram, automatic control is ineffective because response of the mechanism is unstable. In the center diagram is shown a system operating without overshoot and reaching the patch of the radio beam center line in the minimum solution time. In the lower diagram, applying to a control system with slow response, the plane takes unduly long to reach the center line to be guided to the plane's destination.

THE INSTITUTE GAZETTE

PREPARED IN COLLABORATION WITH THE TECHNOLOGY NEWS SERVICE

Progress Report

OPENING the season's activities, when the 258th meeting of the Alumni Council of M.I.T. met in the Graduate House for its customary dinner and business meeting, were 139 members and guests. Raymond H. Blanchard, '17, newly elected President of the Alumni Association, presided and introduced other officers elected to serve for the coming year, as well as new Term Members of the Corporation and of the Faculty.

Charles E Locke, '96, Secretary, reported that earlier in the day the executive committee had approved 97 changes of class affiliations, mostly for veterans who after returning to the Institute preferred to be affiliated with classes with which they originally entered M.I.T., and that recognition had been given to the new M.I.T. Club of the Lehigh Valley. Since May, 37 visits to 19 M.I.T. clubs had been made by Faculty or staff members. In spite of increased costs, offset by increased advertising revenue, the year's operations for The Technology Review were in the black. New representatives of several local clubs were elected, as were also honorary secretaries. Henry B. Kane, '24, Alumni Fund Director, reported a 10 per cent increase in the total Fund, with average contributions of $18.30 as against $16.60 for a year ago. Resolutions for the late George W. Kittredge, '77, were presented by Andrew D. Fuller, '95, and these resolutions were accepted by standing in silence.

At the conclusion of the formal business of the meeting, President Blanchard called upon Wallace M. Ross, General Secretary of the Technology Christian Association, who spoke on developments at the Institute's Freshman Camp since it was organized in 1926, the fifth such camp to be inaugurated in the United States. For many years, the Freshman Camp activities were held at Lake Massapoag in Dunstable, Mass., and were highly successful in acquainting new students with the life they would lead at the Institute. During World War II it became necessary to give up outdoor camp activities but a suitable program of good fellowship, in which M.I.T. traditions were passed on to incoming freshmen, was held in Walker Memorial. This year, 524 freshmen, 26 counselors, and 15 Faculty members attended Freshman Camp at Camp Wonderland in Sharon, Mass. For the first time, women students participated in activities this year in an active week-end program which did much to start new students off properly in their new life at M.I.T.

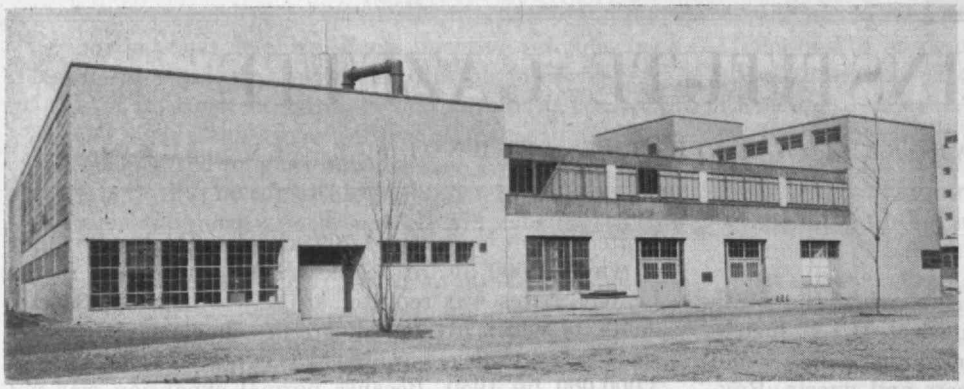
Mr. Blanchard then called upon President Compton who had been scheduled to speak on latest developments at M.I.T. Dr. Compton announced that student registration had reached an all-time high of 5,630 and that it is estimated that the Institute's incoming class will reach its peak next year with 800 freshmen. At the same time, it is anticipated that total enrollment will drop to a figure between 4,600 and 5,000 students.

In summarizing the present status of higher education in this country, President Compton stated that the United States has about 1,700 schools of higher learning, of which 1,000 award degrees. Total enrollment in the United States was reported to be about 2,333,333 students, of which about half are in schools supported by state taxes. College enrollment is expected to increase to 3,000,000 by 1950. Because normal expansion was not possible during the war years, all schools and colleges are overcrowded at present. The large number of students who have entered college since the war place a burden on these educational institutions which has made it impossible for them to maintain the highest academic standards. In accordance with the thoughts expressed in his annual report to the Corporation, President Compton emphasized the need for the Institute, and other privately endowed institutions of higher learning, to provide outstanding training for superior students.

Also announced by President Compton was the progress which has been made in expanding educational facilities at the Institute. The projects include: (1) the new Senior House, ready in October, 1948, for which $500,000 has been contributed through the Alumni Fund; (2) the Army drill shed being transported to M.I.T.,



Donald F. Carpenter, '22, chairman of the Corporation Committee on Student Activity, Raymond H. Blanchard, '17, President of the Alumni Association, and George K. Parmelee, '48, President of the Institute Committee, watch President Compton break ground for the new Senior House now being built along Memorial Drive on Institute property west of Massachusetts Avenue.



The new Gas Turbine Laboratory of the Institute, equipped with the most advanced facilities for graduate instruction and fundamental research, was dedicated on October 7 at ceremonies attended by Army and Navy officers, members of the Corporation, and leaders in industry.

Speakers at the dedication ceremonies were Alfred P. Sloan, Jr., '95, chairman of the board of General Motors Corporation and a Life Member of the M.I.T. Corporation, and Gordon S. Rentschler, Life Member of the Institute's Corporation, head of its Visiting Committee on Aeronautical Engineering, and chairman of the National City Bank of New York. Guests were conducted on an inspection tour of the new laboratories illustrated here, as well as the adjoining Sloan Laboratories which were established several years ago. Following the inspection, President Compton entertained the guests at luncheon in the Graduate House, at which Marvin W. Smith, chairman of the Westinghouse Educational Foundation, and Rear Admiral Lawrence B. Richardson, '21, Vice-president of Curtis-Wright Corporation, spoke.

part of it to be used for an athletic cage, and the other part for air research in Bedford, to be ready March 1; (3) the full-time use of the Cambridge Armory for athletics and drill; (4) the new supersonic wind tunnel which is under construction; (5) the new Gas Turbine Laboratory dedicated in October; (6) the Charles Hayden Memorial Library, for which plans are being beneficially revised when it was found that the lowest of bids received was $1,000,000 above the funds available; (7) the new Hydrodynamics Laboratory and Towing Tank which is one of the must items of the future; (8) new Machine Tool Laboratory, for which a large amount of equipment is already on hand, which is another must item for the future.

Arthur G. Robbins: 1862–1947

ARTHUR GRAHAM ROBBINS, Professor Emeritus of Topographical Engineering, died at his home in Winchester, on October 26. Born in Carlisle, Mass., on July 11, 1862, he studied at M.I.T. from which he received his bachelor of science degree in 1886. The same year he joined the Institute staff as assistant in the Department of Civil Engineering. He became an instructor in civil engineering two years later, and an instructor in highway engineering in 1893. In 1896 he was made assistant professor of highway engineering and in 1906 became associate professor of topographical engineering. He was advanced to professor of topographical engineering in 1909, which post he held until his retirement in 1932.

William H. Jones: 1886–1947

WILLIAM HENRY JONES, Associate Professor of Heat Engineering, Emeritus, died on October 17 in Watertown. He was born in Cochituate, Mass., on June 27, 1886, and attended M.I.T. from which he received a bachelor of science degree in 1909. Two years later he joined the Institute staff as an assistant, and became an instructor in the Department of Mechanical Engineering the same year, 1911. He became assistant professor of experimental engineering in 1925, associate professor of experimental engineering in 1931, and associate professor of heat engineering in 1934. He became emeritus associate professor in June, 1947, and was active as a lecturer when he died.

Forthcoming Events

TIME, with its disquieting habit of progressing at a much faster pace than most of us acknowledge, will soon be beckoning us to attend the forthcoming gathering of Technology Alumni at the Midwinter Meeting to be held in Walker Memorial. This important event, for which Alumni in the metropolitan area of Boston gather annually for an evening of good fellowship, has been set for Saturday, February 7. Robert C. Casselman, '39, has been chosen chairman of the Boston Midwinter Meeting.

While on the subject of casting shadows of forthcoming events, it may be well to remind Review readers that Alumni Day, 1948, will be held on Saturday, June 12. William W. Garth, Jr., '36, chairman of the Alumni Day Committee, promises an outstanding symposium, along with the traditional class reunions and Stein-on-the-Table Banquet in the evening.

Albert A. Schaefer: 1884–1947

ALBERT ADAMS SCHAEFER, Professor of Law and Government and Director of the Puerto Rican Fellowship Program, died on October 23. Professor Schaefer was a native of Middletown, Conn., where he was born on February 25, 1884. He was educated at Phillips Exeter Academy and at Harvard College from which he received a bachelor of arts degree in 1906. Three years later he was graduated from the Harvard Law School.

Professor Schaefer's professional career in law began in Boston in the office of the District Attorney. In 1913 he began his association with the Boston firm of Ropes, Gray, Boyden, and Perkins, specializing in trial cases until his retirement from the firm in 1935.

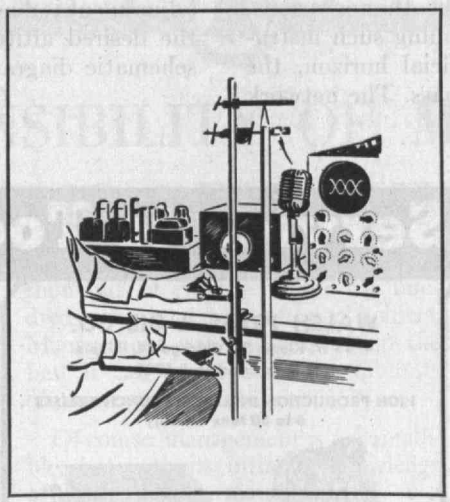
His association with the Institute began in 1930 when he was appointed special lecturer in law in the Department of Business and Engineering Administration. He was appointed assistant professor in 1931, associate professor in 1935, and was advanced to professor in 1940. In addition to his academic duties, he has been most active in the affairs of the Institute and was widely known among the student body with whom he was very popular. He has been a member of many committees and a past president of the Faculty Club.

BUSINESS IN MOTION

To our Colleagues in American Business . . .

Most people think of brass tube as a mill product with a great many important industrial uses. It is regularly used to carry water and other liquids, to make parts of machines and appliances, railings, handles, and so on. Yet it also can be a musical item, in door chimes, and the story of its development for that purpose is an unusual one.

When electric door chimes appeared, it became evident that here was an entirely new requirement for brass tube—that it produce a pleasing tone when struck. The other factors that have made brass tube a staple, large-volume product for so many years, such as its rich color and corrosion resistance, dictated the choice of brass. Here, then, was the problem: what are the causes of pleasing tone in tube, and how can they be controlled in the mill in order to supply a reliably standard musical product?



The first step was purely experimental. Revere proceeded by ear. Over 100 samples of tubes in various alloys, tempers and gauges were hung up, struck, listened to, and preferences obtained from many people. These tests showed an outstanding preference for the tonal quality of one type of tube. But Revere did not stop there. It was desirable to know why that tone was preferred, what factors were responsible for it, and how they could be controlled.

The project then was turned over to a laboratory physicist who is also a talented musician. Now began the most ambitious and lengthy and scientific part of the work, employing the most modern electronic apparatus, including a beat-frequency oscillator and a cathode ray oscilloscope. These made it possible to dissect the tone produced, measuring the intensity and frequency of the fundamental note and its partials with an accuracy of one cycle per second. Much new information was developed concerning the source of the tone, the manner in which the tube vibrates, and the changes in the tone produced by changes in tube characteristics. The net result is that Revere really knows chime tube, scientifically, musically, physically, and, of course, how to produce it. We also know exactly how a chime tube should be plugged, and where struck, and why, which information is of value to door chime manufacturers.

As Revere contemplates the voluminous laboratory records of this work it realizes that interesting and important though it was, it is by no means a solitary example. Revere has repeatedly studied in the greatest detail both new and old applications of its mill products, and uncovered data of value in extending the life and usefulness of them. So, for that matter, has practically every other supplier of materials to industry. Hundreds of companies operate well-equipped, competently-staffed laboratories. Others employ college laboratories more or less steadily. The final results of these continuing studies are embodied in products and processes, and thus raise the standards of all American industry. In addition, in the majority of cases secrecy as to the information obtained is not imposed, and thus you can obtain not merely better products, but also much information of practical value in their use. It has been pointed out that those who pay for materials also pay for the brains required to develop them, and that therefore those brains should be used. Thus, Revere suggests that no matter what you buy, be it rubber or glass, chemicals or metals, cements or solvents, you would do well to draw upon the brains of your suppliers.

REVERE COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

☆ ☆ ☆

Executive Offices:

230 Park Avenue, New York 17, N. Y.

AUTOMATIC CONTROL OF AIRCRAFT

(*Continued from page 104*)

A device called a comparator, or a course discriminator, compares this reference direction with the actual direction of travel of the airplane. It detects the discrepancy between the two directions and produces a signal or physical energy which is proportional to the divergence between the reference direction and the plane's course, that is, the output from the discriminator is proportional to the course error. The output signal from the comparator is distributed through the dispatching system in such a way that it initiates and actuates the required control mechanisms to bring the airplane back on its prescribed course. In the block diagram of Fig. 1 these functional elements are shown in a typical application for the control of pitch or elevation of a commercial aircraft.

To understand more fully the functioning of an automatic pilot it will be desirable to examine the several essential functional components, particularly as these may be used to control pitch or elevation in flight.

Course Indicator

On occasion, as for example on a clear day when he is coming down for a landing, the pilot receives information about his course by direct observation of the ground and he then requires no instrumental aids. On other occasions, he may determine his heading by scanning such instruments within the aircraft as the artificial horizon, the magnetic compass, and the radio compass. The network of radio beams, lacing the United States and tying together the important airports, offers a third method for course determination, for the pilot may "ride the beam" in flying from one airport to the next. The presence of the beam may be made evident to the pilot as a series of audible dots and dashes which he translates into the position of the plane with respect to the beam. The course indicator of an automatic pilot could be either the flight instruments within the aircraft or the detector of the radio beam.

Except for the periods just after take-off and just prior to landing, the flight plans usually require the airplane to fly at a constant altitude. The artificial horizon aids the pilot in meeting this requirement by indicating the pitch angle of the airplane with respect to horizontal. When the pitch angle is zero the airplane is in level flight and hence will maintain the desired altitude. As shown in the functional block diagram of Fig. 1 and the schematic operating diagram of Fig. 2, the sensitive element in the artificial horizon is the vertical gyroscope, commonly called a gyro, whose rotational axis is kept perpendicular to the surface of the earth by an erecting mechanism. The vertical gyro thus establishes, within the plane, a reference axis from which the pitch error of the plane may be determined and appropriate corrections made.

When engaging the automatic pilot an elevator trim adjustment is made manually until the airplane maintains the desired altitude. This adjustment is shown in the schematic diagram of Fig. 2 as a mechanical rack and

(*Continued on page 110*)

A Threefold Service to Tool Engineers

SIZE CONTROL CO.
2528 Washington Blvd., Chicago 12, Illinois
Phone: Monroe 6710

Originators of *REVERSIBLE THREAD GAGES* that combine maximum economy with precision. Still in service are *Size Control* reversible plug gages that have been ground back three times on leading edge at both ends . . . six gages in one at no extra cost!

REVERSIBLE PLUG GAGES
(Pat. appl. for)



Threaded



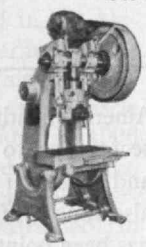
Plain

Plug Gages	*Ring Gages*	*Measuring Wires*
Plain Reversible	Plain Ring	
Thread Reversible	Thread Ring	Thread Wires
Taper-Flat-Special	Taper-Specials	Gear Wires
		Special Wires

Tool Steel – Chrome – Tungsten Carbide – Stellite – Sapphire – Gage Sets Drill Sets – Number Sets – Fractional Sets – Dowel Pins – Centerless, Thread, Cylindrical Grinding.

WALSH PRESS & DIE CO.
4755 W. Kinzie St., Chicago 44, Illinois
Phone: Esterbrook 6700

HIGH PRODUCTION INCLINABLE PUNCH PRESSES
6 to 80 tons capacity



With



WALSH POWER PRESS SAFETY DEVICE with non-repeating attachment . . . saves fingers and hands . . . can be fitted to any make of power press . . . simple, foolproof.

PUNCH PRESSES – KICK PRESSES – DEEP DRAW PRESSES – SAFETY DEVICES – STOCK REELS

WACKER SALES DIVISION
35 E. Wacker Dr., Chicago 1, Illinois
Phone: Central 0375

Complete Gaging Source in ILLINOIS – WISCONSIN – IOWA area for

B. C. Ames Co.
Dial Indicators, Gages

Brush Development Co.
Surface Analyzers, Oscillographs

Riehle
Material Testing Equipment

Webber
Gage and Angle Blocks

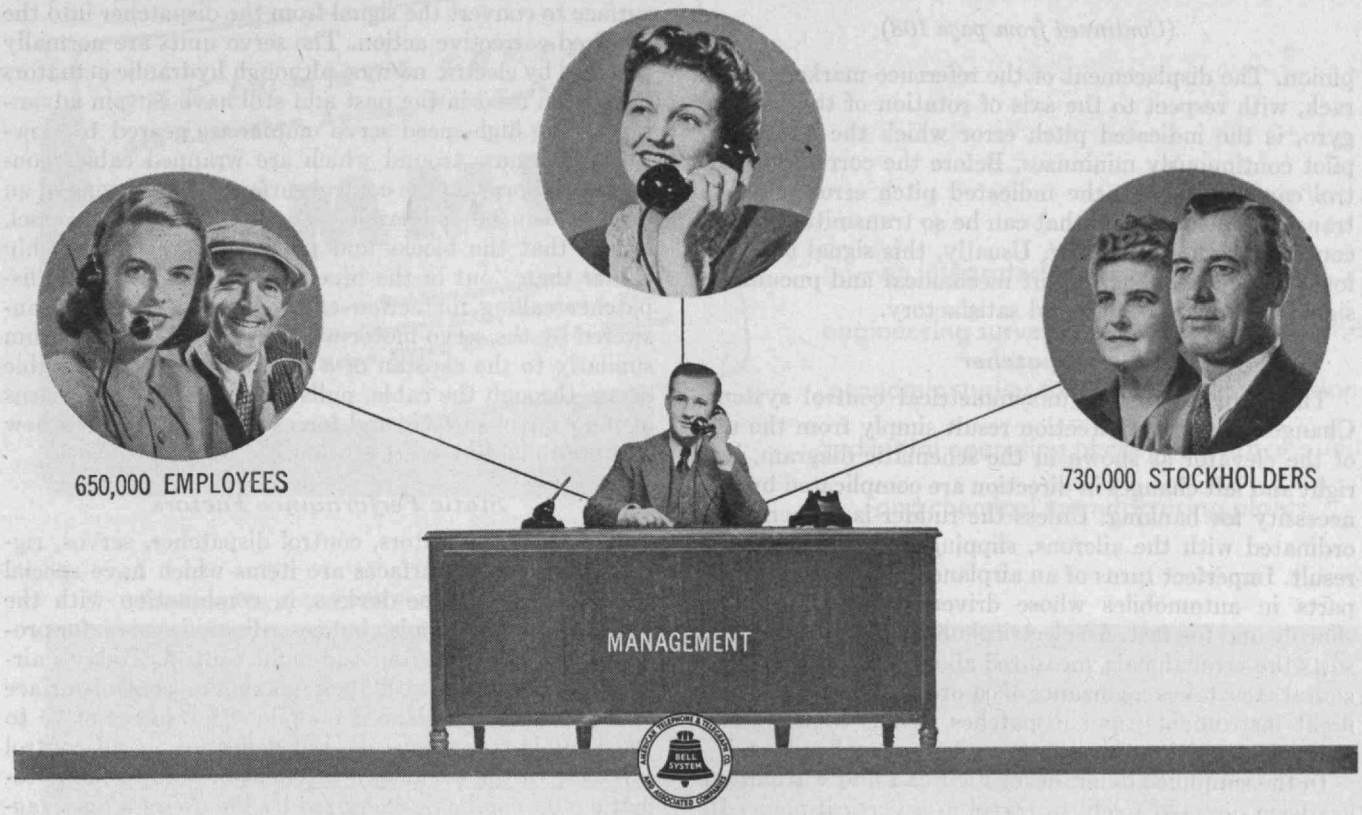
Gem
Toolmaker's Indicators

Ferriot Bros.
Air Tools, Rotary Files

Waltham
Spline Gages, Master Gears

Suman
Snap Gages

DIVISIONS OF
AMERICAN GAGE & MACHINE CO.
Engineering Representatives in Principal Cities



THE RESPONSIBILITY OF MANAGEMENT IN THE BELL SYSTEM

IT USED TO BE that the owners of practically every business were themselves the managers of the business. Today, as far as large businesses are concerned, a profound change has taken place. In the Bell System, for instance, employee management, up from the ranks, and not owner management, is responsible for running the business.

This management has been trained for its job in the American ideal of respect for the individual and equal opportunity for each to develop his talents to the fullest. A little thought will bring out the important significance of these facts.

Management is, of course, vitally interested in the success of the enterprise it manages, for if it doesn't succeed, it will lose its job.

So far as the Bell System is concerned, the success of the enterprise depends upon the ability of management to carry on an essential nationwide telephone service in the public interest.

This responsibility requires that management act as a trustee for the interest of all concerned: the millions of telephone users, the hundreds of thousands of employees, and the hundreds of thousands of stockholders. Management necessarily must do the best it can to reconcile the interests of these groups.

Of course, management is not infallible; but with its intimate knowledge of all the factors, management is in a better position than anybody else to consider intelligently and act equitably for each of these groups—and in the Bell System there is every incentive for it to wish to do so.

Certainly in the Bell System there is no reason either to underpay labor or overcharge customers in order to increase the "private profits of private employers," for its profits are limited by regulation. In fact, there is no reason whatever for management to exploit or to favor any one of the three great groups as against the others and to do so would be plain stupid on the part of management.

THE BUSINESS cannot succeed in the long run without well-paid employees with good working conditions, without adequate returns to investors who have put their savings in the enterprise, and without reasonable prices to the customers who buy its services. On the whole, these conditions have been well-met over the years in the Bell System.

Admittedly, this has not been and is not an easy problem to solve fairly for all concerned. However, collective bargaining with labor means that labor's point of view is forcibly presented. What the investor must have is determined quite definitely by what is required to attract the needed additional capital, which can only be obtained in competition with other industries.

AND in our regulated business, management has the responsibility, together with regulatory authorities, to see to it that the rates to the public are such as to assure the money, credit and plant that will give the best possible telephone service at all times.

More and better telephone service at a cost as low as fair treatment of employees and a reasonable return to stockholders will permit is the aim and responsibility of management in the Bell System.

Walter S. Gifford

WALTER S. GIFFORD, *President*
AMERICAN TELEPHONE AND TELEGRAPH COMPANY

AUTOMATIC CONTROL OF AIRCRAFT

(*Continued from page 108*)

pinion. The displacement of the reference marker on the rack, with respect to the axis of rotation of the vertical gyro, is the indicated pitch error which the automatic pilot continuously minimizes. Before the corrective control can be effected, the indicated pitch error must be translated into a signal that can be so transmitted to the controls by the dispatcher. Usually, this signal is in the form of electrical energy but mechanical and pneumatic signals also have been found satisfactory.

Dispatcher

The airplane has an unsymmetrical control system. Changes in vertical direction result simply from the use of the elevator as shown in the schematic diagram, but right and left changes in direction are complicated by the necessity for banking. Unless the rudder is properly co-ordinated with the ailerons, slipping and skidding may result. Imperfect turns of an airplane have their counterparts in automobiles whose drivers take corners too sharply and too fast. An electrical unit within the aircraft sorts the error signals, measured about vertical and horizontal axes; takes cognizance of co-ordination signals from flight instruments; and dispatches signals to the servo units that position the elevator, ailerons, and rudder.

In the simplified diagrams of Figures 1 and 2 attention has been directed solely to travel in a vertical plane. In this elementary case the dispatcher is shown as actuating only the elevator.

A servo unit is installed in the airplane for each control surface to convert the signal from the dispatcher into the required corrective action. The servo units are normally powered by electric motors, although hydraulic actuators have been used in the past and still have certain advantages. The high-speed servo motors are geared to slow-turning drums, around which are wrapped cables connected to horns on the control surfaces. The rigging of an airplane can be compared with that of a sailing vessel, except that the blocks and pulleys are inside the ship rather than "out in the breeze." A signal from the dispatcher calling for action of the control system is answered by the servo motor which rotates the cable drum similarly to the capstan of a power windlass. The cable drum, through the cable, pulls on one of the dual horns of the control surface, and forces the surface into a new and presumably correct postion.

Static Performance Factors

The course indicators, control dispatcher, servos, rigging, and control surfaces are items which have special characteristics. These devices, in combination with the airframe, form a complex but co-ordinated system for providing the desired automatic flight control. Today's aircraft are designed with their maximum control-surface loads sufficiently balanced for pilot-stick forces of 75 to 100 pounds to produce desired deflection of all control surfaces. In the event of a mechanism failure, the automatic pilot can be de-energized by the use of a disengaging lever, and the human pilot permitted to regain direct

(*Continued on page 112*)

PIPE HANGER PROBLEMS?

SOLVED by our engineering service — the complete design of piping suspensions for power plants, refineries, and industrials with complete fabrication including auxiliary steel.



P recise hanger engineering and fabrication cuts costs

S tandard hanger parts in stock when you need them

I ntelligent planning assures hangers in time for erection

PIPING SPECIALTIES, INC.

DISTRIBUTORS OF MAGNILASTIC EXPANSION JOINTS

WALTER A. SHERBROOKE '20, PRESIDENT

454 STATLER OFFICE BLDG., BOSTON 16, MASS. Liberty 2-5342

114 LIBERTY ST., NEW YORK 6, N. Y. BEekman 3-7033

1224 COMMERCIAL TRUST BLDG., PHIL. 2, PA. LOcust 4-1889

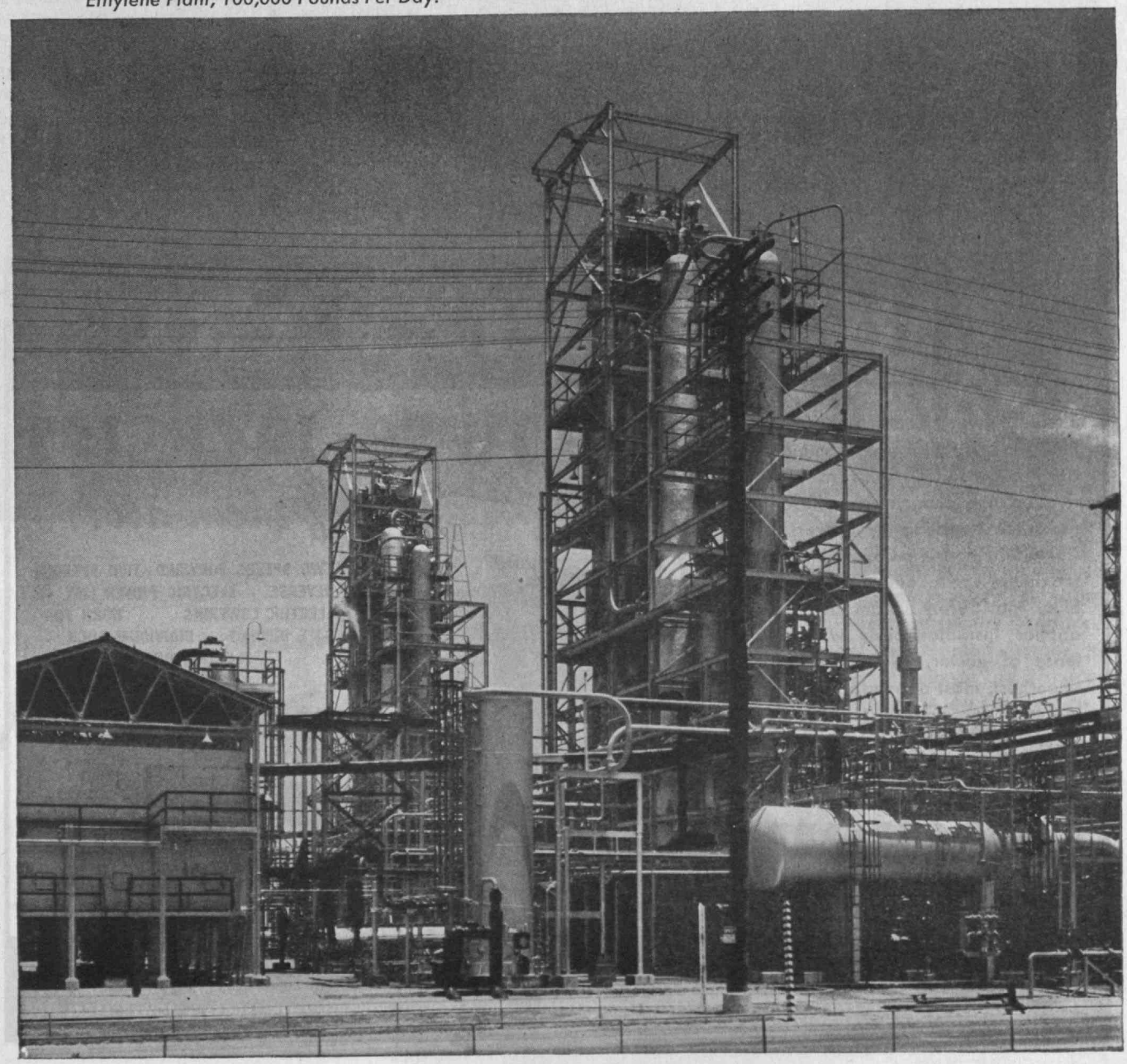
THE LUMMUS COMPANY
420 Lexington Avenue, New York 17, N.Y.

LUMMUS

CHICAGO—600 South Michigan Avenue, Chicago 5, Ill.
HOUSTON—Mellie Esperson Bldg., Houston 2, Texas
LONDON—78 Mount Street, London, W. 1, England

—an integrated service extending from engineering surveys of existing facilities and economic studies to the design, construction and initial operation of chemical process units and chemical manufacturing plants.

Ethylene Plant, 100,000 Pounds Per Day.



AUTOMATIC CONTROL OF AIRCRAFT

(*Continued from page 110*)

control of the airplane. So long as the automatic control merely relieves the pilot, the premium on dependability is not as high as will be required with future aircraft, which may be so large that completely reliable automatic control will be necessary for all flight.

Designers of future equipment will be increasingly challenged with the economic factors of weight and size, in addition to reliability. A single unessential pound of metal in a casting installed in an airplane costs an air line approximately $75 a year. Equipment must be small and compact, or it will never fit into the contours of the wing and fuselage.

Consideration of power is the final static design criterion. While providing increased reliability and power, designers must also watch the weight and size of aircraft equipment with the avidity of a dieting matron.

Dynamic Performance Factors

In any automatic control system, component errors can accumulate with surprising results. As shown in Fig. 1, a part of the output energy is compared to that at the input of a closed loop. Such a closed loop constitutes a regenerative system in which small fluctuations in the input can build up to violent proportions if the magnitude and direction of the energy fed back to the system is not properly controlled. The speed of response of the component elements, as well as of the system as a whole, must also be suitably designed, for the system loses stability if the response is too rapid. Stabilization may be achieved, therefore, by slowing reaction time.

When an airplane is flying at high altitude toward a distant airport, the time necessary to correct an error in the course resulting from a random gust may not be critical. However, when the airport is approached and permission for landing is granted, it is important to get onto the landing beam as quickly as possible. A beacon properly aligned with the runway transmits a conical radio beam which is received by the incoming aircraft. A departure of the incoming aircraft from the center line of the beam can be recognized by noting the resulting increase in signal detected by a radio receiver in the aircraft. These signals can be indicated by a special flight instrument that informs the pilot whether his aircraft is over or under, or to the left or right of the landing path. This equipment permits the pilot to make a blind landing, and its use is called the instrument landing system.

Equipment for securing automatic landing is now undergoing development and test. For this equipment to function properly, the signal detected by the radio receiver must be transmitted continuously to the control servos via the dispatcher. The performances of three possible automatic systems in producing controlled landings are illustrated in Fig. 3. As shown, one automatic system reacts so rapidly that it bounces the airplane out of the radio beam, and hence is unstable and unsatisfactory. At the other extreme is an automatic system so sluggish

(*Concluded on page 114*)

LEWIS-SHEPARD®

POWER JACKLIFT

Master of them all!

The L-S Power Jacklift, built in both Platform and Pallet types, combines all the good features so long needed for economical, efficient materials handling by power, — *Complete Finger-Tip Control* insures maximum speed and maneuverability with *Safety . . . Electric Brake* applies instantaneously with release of power, — the quickest, smoothest, most dependable braking control . . . and *Vertical Handle Operation* permits use in congested areas heretofore inaccessible with this type of equipment.

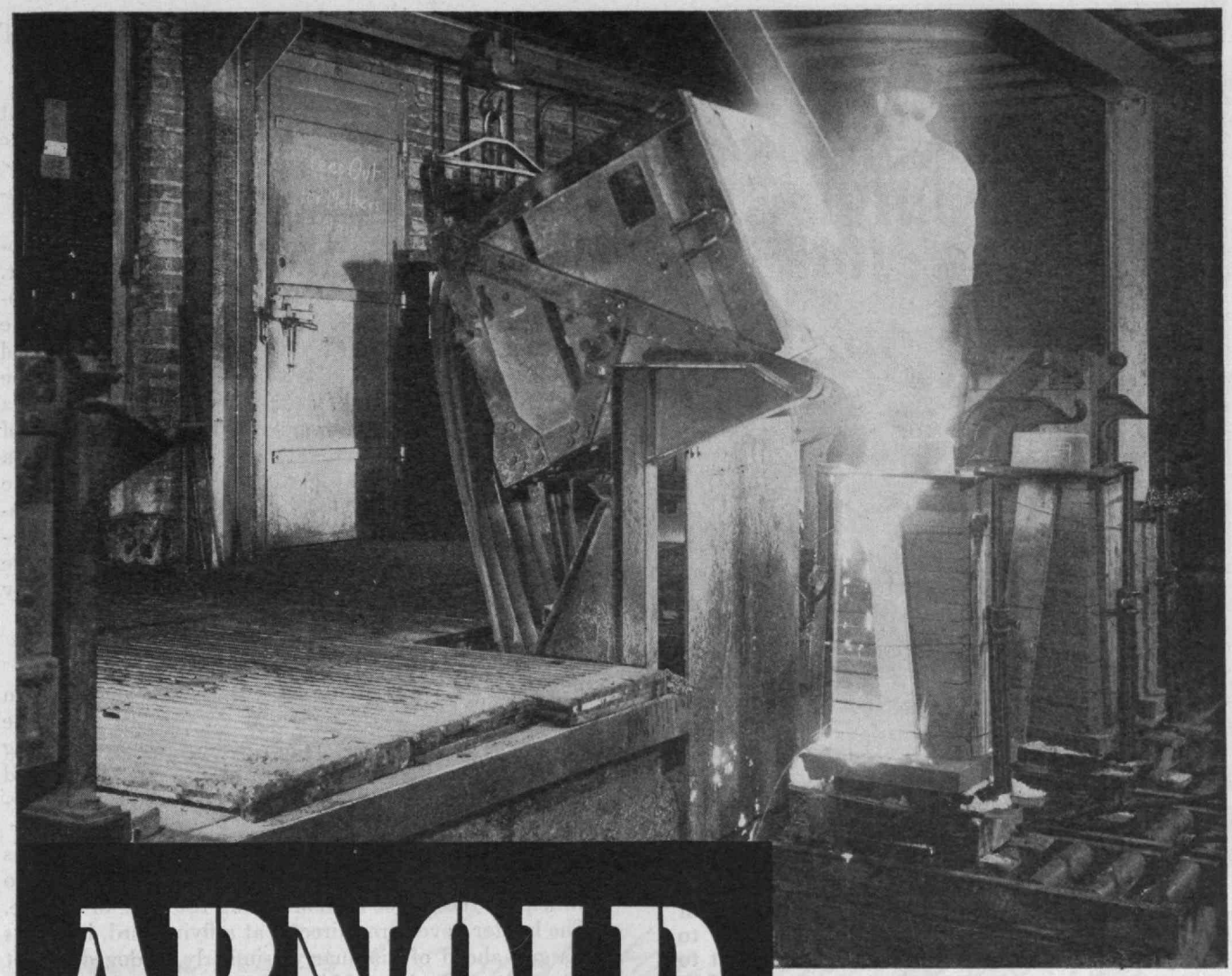
TWO SPEEDS FORWARD . TWO SPEEDS REVERSE . ELECTRIC POWER LIFT . ELECTRIC LOWERING . HORN FOR SAFE DRIVING . INDIVIDUAL LOCK . ELECTRIC BRAKE



LEWIS-SHEPARD
PRODUCTS INC.
251 WALNUT STREET
WATERTOWN 72, MASS.

MULTIPLY MANPOWER · LEWIS-SHEPARD · TRADE MARK

SINGLELIFTS . HYDRAULIC HANDLIFT TRUCKS . JACKLIFTS . SKIDS . FLOOR TRUCKS . PALLET TRUCKS . STACKERS . PALLET STACKERS
PRODUCTION LIFTERS . CRANES . RACKS . ELECTRIC, GAS-ELECTRIC AND GASOLINE POWERED FORK TRUCKS . POWER JACKLIFTS



ARNOLD

PERMANENT MAGNETS

100% quality-controlled at every step from the design board to final assembly

The increased efficiency and economy you'll realize in the use of Arnold Permanent Magnets are *constant* factors. The thousandth unit is exactly like the first—because they're produced under controlled conditions at every step of manufacture, to bring you complete uniformity in every magnetic and physical characteristic. Count on Arnold Products to do your magnet job *best*—and they're available in any grade of material, size, shape, or degree of finish you require. Write us direct, or check with any Allegheny Ludlum field representative.

W&D 1297

THE ARNOLD ENGINEERING CO.

Subsidiary of

ALLEGHENY LUDLUM STEEL CORPORATION

147 East Ontario Street, Chicago 11, Illinois

Specialists and Leaders in the Design, Engineering and Manufacture of PERMANENT MAGNETS

HOW TO SELECT *the Right* UNIVERSAL JOINT



Universal joints perform various functions in a wide variety of applications — from heavy duty power transmission to high or low speed light duty installations. Selection of the *right* joint for the job is important.

Either the Curtis Standard — available in 14 sizes, from 3/8" O.D. to 4" O.D., single or double — or the *new* Curtis Ball-Type in 4 sizes, from 1/2" O.D. to 1-1/4" O.D., will enable you to specify the correct size and strength of joint to secure the most economical and trouble-free installation.

For heavy-duty jobs specify Curtis Standard Joints — made of alloy steel throughout with each part heat treated and ground for maximum strength, long life and accuracy.

For light-duty work specify Curtis Ball-Type Joints — with bronze center ball and steel forks with center pins of heat treated, centerless ground steel.

Select the RIGHT joint for your particular purpose from the data shown below —

Cat. No.	Type	O. D.	Overall Length	Breaking Loads: Static Torque in.-lbs.	Breaking Loads: Tensile Load Pounds
C-642	Std.	1/2"	2"	340	1000
CS-42	Ball	1/2"	2"	170	720
C-644	Std.	3/4"	2-11/16"	1300	2800
CS-44	Ball	3/4"	2-11/16"	650	2000
C-646	Std.	1"	3-3/8"	2500	5150
CS-46	Ball	1"	3-3/8"	1250	3600
C-648	Std.	1 1/4"	3-3/4"	5000	7200
CS-48	Ball	1 1/4"	3-3/4"	2500	4950

All Curtis Joints can be furnished with hubs machined to your specifications. Drawings should accompany inquiry if possible.

For complete engineering data and drafting templates write Dept. B-5

CURTIS UNIVERSAL JOINT CO. INC. SPRINGFIELD MASS.

AUTOMATIC CONTROL OF AIRCRAFT

(*Concluded from page 112*)

that the airplane almost reaches the touchdown point before the solution period is completed. The automatic control with optimum dynamic characteristics is stable, and has a solution period which is relatively short compared with the total landing period.

In order to obtain optimum performance, the automatic control must be tailored for a given type of aircraft. It is essential that the stabilizing constants of the automatic control match the dynamic characteristics of the particular airframe. Most present-day automatic control contains provision for screw-driver adjustments of the stabilizing constants. These adjustments must be set by a cut-and-try process, and frequently the available range of adjustment is insufficient. Techniques that will permit a more accurate appraisal of the desired adjustments are currently being explored. However, a tremendous number of test flights must be analyzed before dynamic designs can be imbued with accuracy sufficient to eliminate completely the necessity for flight adjustments in newly designed aircraft.

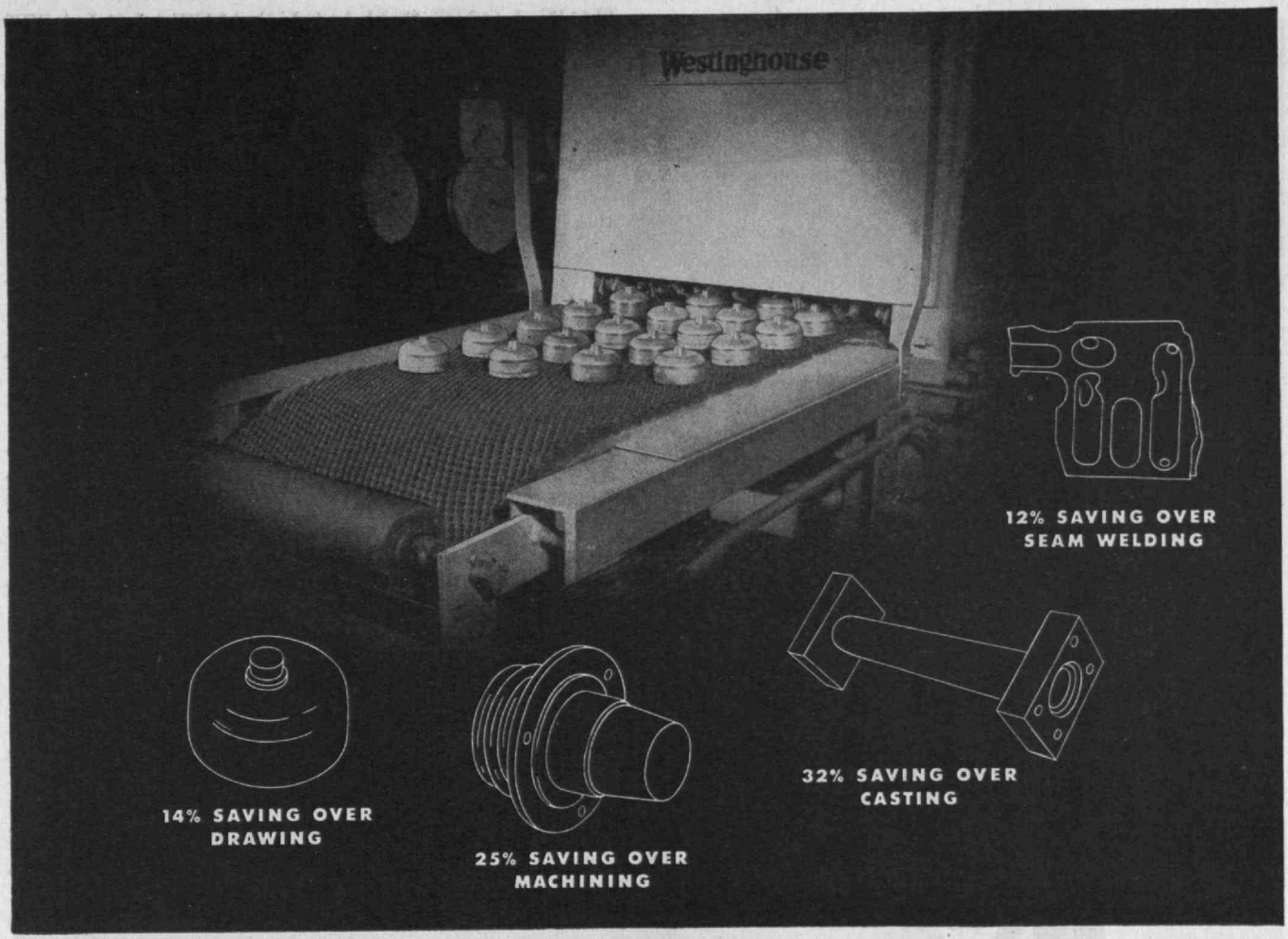
The Guided Missile Problem

A most intricate automatic control system is needed in a guided missile used to intercept a high-speed target. The technique is similar in principle to the automatic landing procedure, but the rates of closure between missile and target are so rapid that the solution period is considerably shorter.

If the guided missile is to intercept the target as quickly as possible, it must carry a course computer to anticipate the target motion during the time of closure. The hunter never fires directly at a flying bird, but aims his gun ahead of his quarry; similarly, a dog does not chase the tail of a rabbit, but tries to anticipate the rabbit's motion by heading him off. A determination of the expected target motion permits a similar aiming of the guided missile at a point in advance of its victim.

The Instrumentation Laboratory at M.I.T., under the direction of Dr. Charles S. Draper, '26, has been designing computers of target lead for nearly a decade. The operation of the computer is based upon the principle that, when a pursuing airplane is continuously pointed at a moving target, the rate of turn of the airplane is directly associated with the lead necessary to anticipate a future collision with the target. When the desired lead, as indicated by the course computer, is equal to the actual lead, as measured by the course indicator (the seeker), the missile is assumed to be on course and no corrective action is required. When computed lead is not equal to actual lead, a correction must be applied to the controls.

In conclusion, the field of aircraft automatic control offers an intellectual challenge to the engineer. In order to comprehend a given system, the engineer must have a reasonable command of mathematics, aeronautics, electronics, mechanics, and instrumentation. He must have the imagination to use the best combination of the equipment developed by each of these fields in order to design a given system. His goals must be improvement in the safety of present-day travel and a broadening of the scope of future travel to include all-weather flying. Inevitably, he must not overlook the applications of his craft to weapons which will ensure the military security of his country.



ELECTRIC HEAT IS *Good for the Joints . . .*

INVESTIGATE!

Electric furnace brazing is just one of many new or improved electrical techniques for producing faster, cheaper and better. Westinghouse engineers can quickly give you salient facts on others applicable to your industry, including the following:

- Induction Heating (metals)
- Dielectric Heating (non-metals)
- Infrared Drying
- Automatic Welding
- Resistance Welding

Write or phone your nearest Westinghouse office for details.

There are many practical ways to join two metal parts together—with or without applying heat. They can be bolted, riveted, threaded, spot-welded, arc-welded, torch-brazed or hand-soldered.

One of the newest, simplest and lowest cost methods of joining a large number of parts quickly and uniformly is by electric furnace brazing. Two useful forces—electricity and capillary action—team together to do quantities of work in minutes that would take hours by any other method.

Fan housings, formerly drawn, are being electric furnace-brazed from two pieces for 14½% less. Discharge flanges and tubes, formerly expensive steel castings, are now furnace-brazed from cold rolled stock at a saving of 32%. Nozzles, formerly produced by screw machines, are now produced by furnace brazing four joints simultaneously. Saving: 25% plus release of needed screw machine.

Electric furnace brazing, in many cases, provides greater strength, better heat conductivity, gas tightness, ductility or appearance. It may also permit production of assemblies with joints inaccessible for joining by any other means. Westinghouse produces a complete line of conveyor and batch-type electric furnaces. Capable Westinghouse engineers will be glad to advise you in regard to the benefits furnace brazing may offer in *your* operations. Call on them. Westinghouse Electric Corp., Dept. T, P. O. Box 868, Pittsburgh 30, Pa.

J-85005

Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

MORE PRODUCTIVE POWER FOR INDUSTRY

Perfection of Fit!



There is no Style without Fit

"Perfection of Fit," as defined by the *modern* Rogers Peet, is the result of years of experience — years of unending effort to come as close to perfection as human hands can, not only in fitting the easy-to-fit, but also the hard-to-fit.

Our definition of Fit also includes the finest imported and domestic woolens; careful, unhurried tailoring — and *Values* that carry on our time-honored tradition of full money's worth.

Styles for young men, and men who never grow old.

Rogers Peet Company

Makers of Fine Clothes

In New York: Fifth Avenue *at* 41st Street · Thirteenth St. *at* Broadway · Warren Street *at* Broadway · *And in Boston:* Tremont St. *at* Bromfield St.

HOW LONG WILL OUR METALS LAST?

(*Continued from page 101*)

certain purposes. It is an important constituent of stainless steel and increasing amounts are being used.

New discoveries of nickel ore deposits are being made from time to time in Canada and other parts of the world and there seems to be no great alarm regarding depletion of world supplies.

Several other metals are of interest principally because of their use as constituents of important alloy steels. These are manganese, chromium, tungsten, vanadium, and molybdenum. The United States has ore deposits of all of these but is self-sustaining only in molybdenum.

The United States Bureau of Mines has developed a process for producing pure metallic manganese by depositing it electrolytically from acid aqueous solutions. No important uses have yet been developed for metallic manganese as such but the electrolytic material is being used to alloy with other metals and is particularly of value when an iron-free manganese alloy is desired. Our domestic manganese ores are low grade, difficult to use, and, on the whole, less satisfactory than high-grade imported ores. Our principal imports are from Russia, India, Brazil, Cuba, and Africa.

Chromium is used as a minor constituent in several alloy steels and in larger amounts in stainless steel. It is also used extensively for chromium plating. In addition to this, chrome ores are used for making refractory brick used in some smelting furnaces. Chrome ores are imported from New Caledonia, Rhodesia, South Africa, Turkey, and other countries.

Tungsten is essential for high-speed, tool steel and is used in smaller amounts for incandescent lamp filaments. The deposits in our northwestern states do not supply our needs. China makes up the deficiency.

The principal use for vanadium is in tool steel where small percentages are beneficial. The United States has several mines but they do not supply all our needs. The deficiency is made up by importations from Peru.

Molybdenum is a relatively newcomer in the alloy steel field but it has made an important place for itself in various types of structural and tool steels frequently associated with chromium as an alloying agent and often in small amounts. The world's largest known deposit is the Climax mine in Colorado and for a time this supplied practically all the world's needs. Deposits have now been developed at several points in this country and in other countries. A substantial tonnage of concentrates is being produced in this country as a by-product of copper concentration. It is present in such small amounts in some copper mines that until recently it was neglected but in the perfecting of concentration methods it was found that the molybdenite mineral could be profitably segregated and marketed. Pure metallic molybdenum has been produced and at present finds a minor use as wire and sheet but it is possible that these uses may be expanded. Resources in molybdenum seem to be adequate for an indefinite period.

Cobalt is a metal which has been used to a limited extent in alloy steels and more recently in conjunction with tungsten carbide for high-speed cutting steel tools. It is attracting increasing attention and research is developing important uses for it.

(*Continued on page 118*)


BANKING FOR NEW ENGLAND
THE NEW ENGLAND
TRUST COMPANY
Member Federal Deposit Insurance Corporation



Reg. U. S. Pat. Off.

Samson Cordage Works

Boston 10, Mass.

Manufacturers of braided cords of all kinds, including sash cord, clothes line, trolley cord, signal cord, shade cord, Venetian blind cord, awning line, etc., also polished cotton twines and specialties.

SPOT CORD

Reg. U. S. Pat. Off.



Our extra quality sash cord, distinguished at a glance by our trade-mark, the colored spots. Especially well known as the most durable material for hanging windows, for which use it has been specified by architects for more than half a century.

CO_2

GAS . . . LIQUID . . . SOLID (Dry Ice)

THE LIQUID CARBONIC CORPORATION

3100 South Kedzie Avenue, Chicago 23, Illinois

U. S. A.

28 Producing Plants
More than 50 Distributing Points

CANADA

Halifax to Vancouver

OVERSEAS

England, Cuba, Mexico, Venezuela, Colombia, Trinidad, Brazil

Liquid
RED DIAMOND
Gas and Dry Ice

HOW LONG WILL OUR METALS LAST?

(*Continued from page 116*)

Zirconium is a metal which is little used at present but may have some interesting uses. Research laboratories are studying its alloys with copper and other metals and some valuable properties are already indicated.

Titanium is a widely distributed element and many large deposits are known in this and other countries. If it comes into general use, however, it is doubtful if this country would be self-sustaining. At present titanium oxide is being increasingly used in paint manufacture. Titanium alloys with copper have properties resembling tin bronze. Ductile titanium has been produced and we shall doubtless be hearing more of the metal and its alloys. Since titanium is so abundant in the earth's crust we should use it to supplement our nonferrous metal supply.

Beryllium is one of our lightest metals but it can never compete in quantity production with such light metals as aluminum and magnesium. The only mineral of beryllium which has been found in sufficient quantity to serve as an ore is beryl and here the beryllium oxide is chemically combined with silica and alumina making a low-grade mineral which must be broken up by expensive chemical methods followed by other expensive treatment for recovery of the metal. Also beryl is by no means abundant and is expensive to mine. It seems doubtful if beryllium can ever be produced for less than $2.00 per pound which definitely limits its use in the pure state to special purposes or as an alloying constituent where it forms a very minor part of the alloy.

The United States produces considerable antimony as a by-product in lead refining but this country is far from self-sustaining. The world's largest producer is China.

Cadmium is frequently associated with zinc and most of the world production comes as a by-product from smelting or leaching zinc concentrates. A minor amount is produced as a by-product of lead smelting. Cadmium is frequently a constituent of alloys having low fusibility. It is also used for coating steel which may be subjected to salt water corrosion. Some cadmium compounds are used for pigments. It is not available in large quantities and expansion of uses is limited for this reason.

Mercury, sometimes called quicksilver, is the only metal which remains liquid at ordinary temperatures. Most of the world's supply is produced in Italy, Spain, and the United States. It is used for making amalgams, as a detonator for explosives, and for making such instruments as thermometers and barometers. Some interesting experiments have been carried out which show that mercury is more efficient than water when used in boilers. This is only of academic interest however for the world's known deposits would supply only a relatively few plants. Small amounts of mercury compounds are used in the drug industry. The known supplies of mercury are not large but the uses are not expanding.

Thorium and uranium are now attracting world attention. The possible use of the former is intriguing but the latter is definitely of extreme importance.

It can hardly be said that uranium is a new metal. As long ago as 1922 a student in the M.I.T. Metallurgy Department studied the effect of uranium additions to steel. The present interest in uranium, however, is due to a property unthought of at that time.

(*Continued on page 120*)

Doelcam Corporation

PRECISION INSTRUMENTS

GYROSCOPES — GYROSCOPIC DEVICES

DESIGN • DEVELOPMENT • PRODUCTION

437 CHERRY STREET, WEST NEWTON 65, MASS.

TRADE MARK
HEVI DUTY
REGISTERED U S PAT OFFICE

Hevi Duty Electric Co.

Electric Heat Treating Furnaces
Surges Dry Type Transformers

MILWAUKEE 1, WISCONSIN

Hevi Duty Precision Electric Heat Treating Furnaces are built in a large variety of types and sizes — for many heat treating operations — with temperature ranges to 2500° F. (1371° C.). They are standard production equipment in many national industrial plants.

Write for descriptive bulletins

HAROLD E. KOCH '22, *President*

ELTON E. STAPLES '26, *District Manager, Cleveland*

HEVI DUTY ELECTRIC COMPANY

HEAT TREATING FURNACES HEVI-DUTY ELECTRIC EXCLUSIVELY
MILWAUKEE 1, WISCONSIN

TRADITIONAL SYMBOL OF DEPENDABILITY AND LOW OPERATING COST SINCE 1889

Built by the
BATH IRON WORKS CORP.
Shipbuilders and Engineers
BATH, MAINE, U.S.A.
HULL NO. 284
1947

BUILDERS OF PRIVATE, COMMERCIAL AND NAVAL VESSELS

HAROLD J. RYAN, INC.

Air Conditioning

101 PARK AVENUE NEW YORK 17, N. Y.

OUR

Ski Department

IS OPEN!!!

Offering an Excellent Selection of

Skis,

Boots,

Poles,

Bindings,

Gabardine Trousers,

Jackets and

Accessories for both

Men and Women

Bindings and Steel Edges Mounted

•

The COOP

Harvard Square Store

HOW LONG WILL OUR METALS LAST?

(*Continued from page 118*)

Extravagant prophecies have been made regarding the use of fission products from uranium for power purposes and in the light of our present knowledge it would be presumptuous to say they are not possibilities. It is fair to point out, however, that publicly known deposits of uranium ore are not extensive and the uranium content is not high. The making of a suitable concentrate and its reduction to metal is costly and the treatment of this metal to separate the relatively small amounts of desirable isotopes is still more costly. Discovery of considerable additional ore and substantial reduction in extraction costs would seem to be necessary if atomic power is to compete with other sources of power on a world-wide basis. Of course if thorium or other elements become equally satisfactory as uranium the picture may change.

Regardless of the future use of atomic power, we have with us at the moment two uses of fission products which are not dependent on large production or low cost. The first is beneficial and is being eagerly experimented with by the medical profession. The world welcomes the use of these radioactive materials which may cure many human ills. The other use is diabolical and has possibilities of unbelievable destruction.

A material which is known to have such stupendous possibilities for good or ill should not be in the control of any individuals or separate nations but should be held in trusteeship for all of humanity.

Trusteeship of fissionable materials must be exercised at the source if it is to be effective. No formula for bringing this about is proposed but it is imperative that these materials be made universally available for human advancement and kept out of the hands of those who would destroy. Any method which does not start with control of the initial output seems doomed to failure.

General Conclusions

It is obvious that general economic laws will have a marked effect on the depletion of our metallic resources. It is inevitable that, as prices for any one metal rise, nonessential uses will decline and substitution of other metals and nonmetals will take place. Also, countries which have a shortage will import from countries having abundance.

As long as fear of war prevails, each country will try to become self-sustaining as far as possible, but unfortunately this goal is impossible of complete attainment.

The United States is far better provided with metallic resources than any other nation but its consumption is large and the country is deficient in several elements. Ever since World War I a few far-sighted men have urged the stock-piling of several years' supply of vital ores. The number of such men is increasing but they meet opposition from others who are interested in developing such resources as we have.

The writer is in complete sympathy with the first group and makes a few suggestions from that point of view:

(1) Even in cases where we are self-sustaining, if a deficiency is not far away we should encourage moderate importation of ores and concentrates and possibly metal. In such a class would fall iron, copper, lead, and zinc.

(2) We should import and stock-pile manganese ores, chrome ores, tin ores, and tungsten ores. Our manganese

(*Concluded on page 122*)

BALTIMORE
BUFFALO
CHICAGO
CINCINNATI
CLEVELAND
COLORADO SPRINGS
COLUMBUS
DALLAS
DAYTON
DENVER
DETROIT
HARTFORD
HOUSTON
KANSAS CITY
LAWRENCEVILLE, N. J.
LOUISVILLE
NEW HAVEN
OMAHA
PHILADELPHIA
PITTSBURGH
POTTSTOWN, PA.
PRINCETON
PROVIDENCE
RICHMOND, VA.
ROCHESTER
ST. LOUIS
SYRACUSE
WASHINGTON, D. C.

BROOKS BROTHERS' Travelling Representatives will visit 28 places in November and December with comprehensive assortments of our celebrated Ready-made Clothes and Furnishings. If you live in or near one of the cities listed... and are interested in inspecting our local showing or ordering anything from our representatives... write for a copy of our Fall 1947 Itinerary, showing exactly where and when our men will be located.

ESTABLISHED 1818

Brooks Brothers
CLOTHING
Men's Furnishings, Hats & Shoes

OFFICERS' UNIFORMS, FURNISHINGS AND ACCESSORIES
346 MADISON AVENUE, COR. 44TH ST., NEW YORK 17, N. Y.
46 NEWBURY, COR. BERKELEY STREET, BOSTON 16, MASS.
LOS ANGELES • SAN FRANCISCO

The
RUMFORD PRESS
CONCORD
NEW HAMPSHIRE

WHERE
Printing
IS STILL A CRAFT

TECHNOLOGY MEN . . .
CAMPUS ROOM
The Graduate House
Technology's Social Center
is the
HOME FOR YOUR
CLASS FUNCTIONS

MENUS SUBMITTED ON REQUEST

Address: H. K. DOW
THE GRADUATE HOUSE
M. I. T.
Cambridge 38, Massachusetts
Tel. Kirkland 2680

SIMPLEX-ANHYDROPRENE



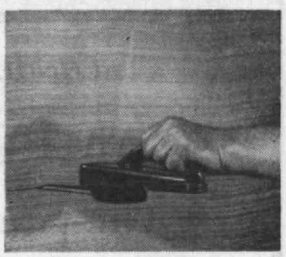
A modern design in wire and cable construction featuring:

- **SIMPLICITY**
  ANHYDROPRENE construction consists of a tinned copper conductor, ANHYDREX insulation, and a thin jacket of neoprene.
- **IMPROVED PROPERTIES**
  ANHYDREX insulation resists moisture more effectively than any other rubber insulation. The cured-in-lead neoprene jacket provides protection from oil, acids, sunlight and flame. It eliminates the need for outer braids.

  ANHYDROPRENE wires and cables are lightweight, have small diameters, and can be easily pulled into ducts or conduit.
- **VERSATILITY**
  ANHYDROPRENE wires and cables can be used for plant and shop wiring, instrument wiring, control circuits, pole line risers, transformer leads, and power circuits.

SIMPLEX WIRE & CABLE CO.
79 Sidney St., Cambridge 39, Mass.

CAMBRIDGE Moisture Indicators



Cambridge Moisture Indicators are accurate, rugged instruments built for continuous shop service to indicate moisture content of various hygroscopic materials. Insertion model has measuring element enclosed in a blade. Surface model has the element mounted on under side for surface contact. Adjustable pointer is provided for fixing reference points of surrounding air.



Surface Model



Insertion Model

For use in Hat, Printing, Textile, Food industries and in processing Paper, Wool, Cotton, Rayon, Fur, Cereals, etc.

Send for literature

CAMBRIDGE INSTRUMENT COMPANY, Inc.

3707 GRAND CENTRAL TERMINAL NEW YORK 17, N. Y.

Pioneer Manufacturers of

PRECISION INSTRUMENTS

HOW LONG WILL OUR METALS LAST?

(*Concluded from page 120*)

ores are, in general, low grade and require expensive beneficiation. With an abundance of foreign ore available our own supplies should remain in the ground for future generations. Chrome and tungsten mining should proceed at a moderate rate and be frankly supplemented by foreign importations.

(3) We are completely deficient in tin ore deposits and yet are the world's largest consumer of tin. We should stock-pile both metal and concentrates and encourage research for finding suitable substitutes for tin in various fields of use.

(4) The United States has no nickel deposits. Canada has the world's largest and also has substantial deposits of copper, lead, zinc, and platinum. Suitable reciprocal relations with Canada would solve our problems in these metals.

(5) We should promote research which tends to bring about conservation of all metals which are scarce on a world basis.

(6) War is our greatest waster of metals and fear of war hampers free exchange of ores and metals in world trade. We should therefore be unremitting in our efforts to promote peace and then approach the subject of metal resources as an international problem. By taking a long-range view it is obvious that the world supply is definitely not inexhaustible.

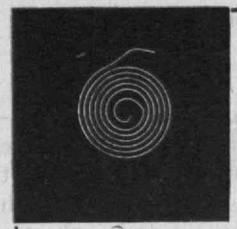
X-RAYS AGAINST CANCER

(*Continued from page 95*)

designed since the war in Dr. Van de Graaff's laboratory is being reproduced in several of the world's principal nuclear research laboratories, among them Cockcroft's National Nuclear Laboratory at Harwell, England, Joliot's laboratory in the College de France in Paris, and the National Research Council's Chalk River Laboratory in Canada. Several dozen electrostatic accelerators scattered about the world, notably including those designed by Professor R. G. Herb at the University of Wisconsin, have been used in research which has made important contributions to the knowledge of nuclear processes.

Back in 1934 the realization that electrostatically generated voltages could also be used in the production of unusually penetrating x-rays for deep therapy led to the opportunity to build the one-million-volt air-insulated generator for the Huntington Memorial Hospital. This machine and its building were financed by the Godfrey M. Hyams Trust, a Boston philanthropy which has continued loyally to support the high-voltage medical work at M.I.T. On March 1, 1937, the first patient was treated at the Huntington, and during the subsequent four and a half years well over 1,000 patients were given complete treatment series. This pioneering effort in radiology disclosed at an early date the great benefits that could be derived in avoiding skin damage and increasing the depth dose by use of roentgen rays produced by several times the standard voltage. In 1939 development of a compact one-and-a-quarter-million volt gas-insulated x-ray source was undertaken for the Massachusetts General Hospital. This generator was

(*Continued on page 124*)



PRECISION-GAUGED HAIRSPRINGS AND FINE ROLLED WIRE

PRECISION PRODUCTS COMPANY
WALTHAM, MASSACHUSETTS
ROBERT I. BRADLEY '20

SWISS AUTOMATICS
Rebuilding and Tooling Service
We have trained personnel and facilities for complete rebuilding and tooling of your Swiss Automatics and other type Swiss Machines.
YOUR INQUIRIES ARE INVITED
BORIS M. VOLYNSKY MFG. CO., INC.
311 West 66th Street New York 23, N. Y.

Lord Electric Company
INCORPORATED
ELECTRICAL CONSTRUCTION

131 Clarendon Street
Boston 16, Massachusetts
Telephone CO 6-0456

10 Rockefeller Plaza
New York 20, N. Y.
Telephone CI 6-8000

1201 Plaza Building
Pittsburgh 19, Pa.
Telephone COURT 1920

The TREDENNICK-BILLINGS CO.
CONSTRUCTION ENGINEERS ★ BUILDING CONSTRUCTION

K. W. RICHARDS '07 H. D. BILLINGS '10 C. C. JONES '12 F. J. CONTI '34

10 HIGH STREET ★ BOSTON, MASSACHUSETTS



Boit, Dalton & Church
INSURANCE SINCE 1865
89 BROAD STREET, BOSTON 10 • *Telephone* HUbbard 2–3100

FREDERIC C. CHURCH CHAS. COLBY HEWITT JOHN W. GAHAN
FREDERICK G. FARQUHAR COLLINS GRAHAM STANLEY H. KING

WILLIAM D. NEUBERG CO., INC.

Chemicals

GRAYBAR BUILDING 420 LEXINGTON AVE.
NEW YORK 17, N. Y.
TELEPHONE LEXINGTON 2-3324
CABLE—"WILNEUBERG"

J. C. CORRIGAN CO., INC.

Conveyers

Engineers • Manufacturers • Erectors
Coal Handling Systems
Materials Handling Equipment
Portable Conveyors

Distributors for
Jeffrey Manufacturing Co.
Jeffrey Parts Carried in Boston Stock

41 Norwood Street, Boston 22, Mass.
Tel. GENeva 0800





Transits and Levels are used on all largest works and by U. S. Govt. for utmost precision. Rental Insts. *New catalog, just issued, sent gratis. A souvenir plumb-bob sent for 3¢ postage.*

BUFF & BUFF CO. Boston 30, Mass.
Henry A. Buff '05

William H. Coburn, '11 William F. Dean, '17

William H. Coburn & Co.
INVESTMENT COUNSEL

68 Devonshire St. Boston, Mass.

— STEEL —

HOT AND COLD ROLLED

Stahleker Steel Corp.

Second and Binney Sts., Kendall Sq., Cambridge 42, Mass.

Telephone Trowbridge 1440
WALLACE BLANCHARD, '16, *Treasurer*

X-RAYS AGAINST CANCER

(*Continued from page 122*)

placed in use in April, 1940, and has since been in continuous clinical use. Between 15 and 25 patients are treated daily with the equipment developed and built at M.I.T., and the voltages now generally used with this apparatus lie in the range between one and a quarter and one and a half million volts. This work has further confirmed the desirability of supervoltages in the treatment of certain types of malignancies and has emphasized the need to investigate the efficacy of roentgen rays produced at still higher energy levels. The electrical engineering group at M.I.T. extended its efforts to the development of a higher-voltage x-ray source for Philadelphia's American Oncologic Hospital. The first generator for Oncologic, completed during the war, was requisitioned by the U. S. Army for nuclear research at Chicago. Its successor, a tiltable two-million-volt unit now nearly ready for delivery, is the most compact supervoltage x-ray source yet seen. Meanwhile, the supervoltage x-ray generator at Technology has made possible the extension of pioneering clinical researches to three million volts and is now being modified to bring the voltage to five million volts.

Present Therapy Spectrum

At no time in medical history have so many types of ionizing radiation been available for therapy and research. Artificially radioactive substances produced within the nuclear pile or by the cyclotron, roentgen rays produced by betatrons with energies up to 100 million volts, high-energy cathode rays, and well-collimated beams of neutrons and protons are all under investigation or proposed for use on the deep-tumor problem. Artificially radioactive substances are of unique and fundamental importance as tracers in biological and clinical research, but only a few materials such as radio-iodine and radio-phosphorus have thus far found limited therapeutic use. Roentgen rays with energies much higher than a few million volts may actually become less desirable for therapy because of the increasing narrowness of the radiation beam at the very high energies and the seriously high exit dose which once again produces skin damage. High-energy cathode rays, which behave like bullets in the sense that they produce no damage in the body beyond their maximum range, are still too new to be fully evaluated, but may find an important place in the future. Cyclotron-produced neutron beams have been investigated for about 10 years at the University of California, with interesting but inconclusive results to date. While all of this spectrum of ionizing radiations will need to be thoroughly studied, it is already clear that roentgen rays produced by a few million volts have the most direct connection with the extensive roentgen therapy experience of the past and offer very significantly improved properties for the treatment of deep malignant tumors.

Electrostatics in Production

Only a few supervoltage equipments constructed by skillful experimenters have thus far been available for research and medicine. With increasing recognition of the unique capabilities of electrostatic accelerators, there

(*Concluded on page 126*)

McCREERY and THERIAULT

Building Construction

126 NEWBURY STREET BOSTON, MASS.

THE MURRAY PRINTING COMPANY

A Complete Printing Organization

Letterpress :: Offset :: Binding

18 AMES STREET
CAMBRIDGE

THE TRIAL IS NEVER OVER



GOOD-WILL is the disposition of the customer to return to the place where he has been served well—

U. S. Supreme Court.

TO OUR FRIENDS

We do not believe that any advertising copy man could have penned a neater and more trenchant definition than this decision of the Supreme Court.

It happens also to be the verdict which our customers have reached regarding their relations with us.

Your specific problems in technical reproduction work from the lowly blue print to the complicated offset printing of an engineering manual, will find their happy solution with us.

ELECTRO SUN COMPANY, INC.

Blue Prints — Photo Prints — Photo Offset

161 Washington Street 157 Chambers Street
Grand Central Terminal Building
NEW YORK, N. Y.

A. L. Weil '01 J. C. Duff '86

If It's Made — Ask ALBERT!

FOR IMMEDIATE DELIVERY
Odd and Large Sizes a Specialty
1/8" to 72"

LARGEST AND MOST COMPLETE STOCK on Atlantic Seaboard

Our Own Shop Facilities for Bending — Coiling — Welding — Threading and Testing —
Meeting All Standard Specifications
TUBE-TURNS, WELDING FITTINGS AND FLANGES

• PIPE
Electric Weld
Seamless
Spiral Weld
Lap Weld
Butt Weld
Steel—Wrought Iron
Corrugated Culvert

• VALVES
Iron Body
Forged Steel
Cast Steel
and
Special
Alloys

• FITTINGS
Welding
Tube Turns
Fabricated
Cast Iron
Forged Steel
Dresser
Victaulic

• PILING
ARMCO
Youngstown
Pile Points
Cobi-Pile Tips
Pile Sleeves
Cobi-Timber Tips

STAINLESS STEEL PIPE, FITTINGS AND VALVES

S. G. ALBERT '29, *Treasurer*

ALBERT PIPE SUPPLY CO., Inc.

No. 13th & Berry Streets, Brooklyn, N. Y. EVergreen 7-8100

FAR EASTERN MANAGER

One year in India. One and one-half years in China. Presently on active duty (Lt. Col., U. S. Army) in Tokyo. Excellent personal connections, official and private (American and Foreign) in Bombay, Calcutta, Hongkong, Shanghai, Tientsin, Tsingtao, Kunming, and Pekin. Well acquainted with official procedures. Broad administrative experience initiating new organizations, personnel, operations, supply, etc. Available to represent important interests. M.I.T. graduate, 1928, single, age 40.

Write Box D, The Technology Review
M.I.T., Cambridge 39, Mass.

LEONARD CONSTRUCTION COMPANY

Engineers and Contractors

SINCE 1905

IN ALL THE AMERICAS AND FAR EAST

37 South Wabash Ave. Chicago
420 Lexington Ave. New York City

MONSANTO CHEMICAL COMPANY

Merrimac Division

EVERETT
MASSACHUSETTS

The largest and oldest chemical manufacturer in New England

SYSKA & HENNESSY

Engineers

Consultation Plans Reports
Power Plant Disposal Plants
Water Systems

NEW YORK, N. Y.

J. F. HENNESSY '24

X-RAYS AGAINST CANCER

(Concluded from page 124)

developed a corresponding need for a reliable commercial source of such devices. Toward the end of 1946, after efforts to utilize existing companies, the High Voltage Engineering Corporation was organized in response to this urgent requirement. Located in a plant near Harvard University, staffed in part by men who participated in the wartime electrostatic program of the Institute and with consultants from M.I.T., the University of Wisconsin, and Rice Institute, this company has gathered the best scientific experience in this important and difficult technique for the benefit of science and medicine. The new enterprise was financed by the American Research and Development Corporation, recently organized by leading New England citizens, including Senator Ralph E. Flanders of Vermont and Harvard's General Georges F. Doriot, who is its president. Advised by Technology's President, Karl T. Compton, Professor Edwin R. Gilliland, '33, of the Department of Chemical Engineering, Jerome C. Hunsaker, '12, Head of the Departments of Aeronautical and Mechanical Engineering, and others, the American Research and Development Corporation has the purpose of encouraging the development of new industries with strong roots in science. No organizational or financial connection exists between Technology and the High Voltage Engineering Corporation, but a mutual appreciation of the need for adequate commercial development of the products of scientific research has created an atmosphere of common endeavor. The High Voltage Engineering Corporation is headed by Dr. Denis M. Robinson, who was Commonwealth fellow at M.I.T. in 1929, scientific representative of the Telecommunications Research Establishment (Britain's radar development laboratory) assigned to the Radiation Laboratory at M.I.T. during the war, and in the first postwar year chairman of the Department of Electrical Engineering at the University of Birmingham in England.

Typically a product of modern times, the High Voltage Engineering Corporation is building the latest tool for medical science against cancer — a compact two-million-volt x-ray source fully as flexible as conventional lower-voltage equipments. Such two-million-volt generators, engineered for therapy and science, are already scheduled for shipment to leading medical and research institutions in England, France, and the United States. At the same time, recognizing that it possesses the knowledge and ability for creating one of the most powerful tools for nuclear research, this company is undertaking the production of electrostatic positive-ion accelerators of still higher energy rating. It is hoped that by this means not a few of the products of fundamental science and engineering may become available for the full use and benefit of all mankind.

PREPARATORY SCHOOLS FOR BOYS

CHAUNCY HALL SCHOOL

Founded 1828. The School that confines itself exclusively to the preparation of students for the Massachusetts Institute of Technology.

FRANKLIN T. KURT, *Principal* 553 Boylston Street, *Boston, Mass.*

HUNTINGTON SCHOOL FOR BOYS

Grades Nine to Twelve.
Thorough preparation for entrance to M.I.T. and other technical schools.
Regular and summer courses.

320 Huntington Ave., Boston Tel. Kenmore 1800

PROFESSIONAL CARDS

JACKSON & MORELAND
Engineers and Consultants

Design and Supervision of Construction
Reports — Examinations — Appraisals
Machine Design — Technical Publications

BOSTON NEW YORK

H. K. BARROWS, '95
M. Am. Soc. C. E.

CONSULTING HYDRAULIC ENGINEER

Hydro-electric Developments — Water Supplies. Reports, Plans, Supervision. Advice, Appraisals

6 BEACON STREET BOSTON, MASS.

EADIE, FREUND AND CAMPBELL
CONSULTING ENGINEERS

500 FIFTH AVENUE NEW YORK 18, N. Y.

Plans and Specifications — Examinations and Reports

Power, Heating, Ventilating, Electric, Plumbing, Sprinkler, Refrigerating, Elevator Installations, etc., in Buildings and Industrial Plants

J. K. CAMPBELL, M. I. T. '11

STARKWEATHER ENGINEERING CO.
INCORPORATED

Engineers and Contractors for Pumping Plants Boiler and Power Plants, Cooling Water and Heat Recovery Systems

246 Walnut Street, Newtonville BIGelow 8042

Wm. G. Starkweather, M.E. Cornell '92 — J. B. Starkweather, B.S. M.I.T. '21

H. A. KULJIAN & CO.
CONSULTANTS · ENGINEERS · CONSTRUCTORS

Specialists in
UTILITY, INDUSTRIAL and CHEMICAL FIELDS

1518 WALNUT STREET PHILADELPHIA, PA.

H. A. KULJIAN '19

FABRIC RESEARCH LABORATORIES
INCORPORATED

Research, Development and Consultation for Textile and Allied Industries

665 Boylston Street Boston, Mass.

W. J. HAMBURGER, '21 K. R. FOX, '40 E. R. KASWELL, '39

GILBERT ASSOCIATES, INC.
ENGINEERS AND CONSULTANTS

Malcolm G. Davis '25, *Vice President* Allen W. Reid '12 E. C. Edgar '35

Steam, Hydro, Diesel Power Plants; Industrial Structures; Plant Safety, Labor Relations, Utility Rates, Valuations, Reports; Large Scale Purchasing; Industrial Laboratory

New York, N. Y. Washington, D. C.
Reading, Pa. Philadelphia, Pa.

FAY, SPOFFORD & THORNDIKE
Engineers

Airports — Bridges — Water Supply and Sewerage
Port and Terminal Works — Fire Prevention

INVESTIGATIONS DESIGNS
SUPERVISION OF CONSTRUCTION

BOSTON NEW YORK

WALLACE CLARK & COMPANY
CONSULTING MANAGEMENT ENGINEERS
Since 1920

Planning for Research and Development, Engineering, Production, Quality Control, Maintenance, Surveys, Industrial Relations, Sales, Management Audits.

521 FIFTH AVENUE NEW YORK 17, N. Y.

MAURICE A. REIDY
Consulting Engineer

BRIDGES BUILDINGS
STRUCTURAL DESIGNS FOUNDATIONS
CONSTRUCTION CONSULTANT AND ARCHITECTURAL ENGINEER

Estimates and Appraisals

101 TREMONT STREET BOSTON, MASS.

THE COSMA LABORATORIES CO.
1545 East 18th Street Cleveland 14, Ohio

Chemical Analysis — Testing — Consulting Engineering
Testimony and Research

H. SEYMOUR COLTON, M.I.T. '21, *Director* — R. W. FRISCHMUTH, Case '38, *Assistant Director*

MORAN, PROCTOR, FREEMAN & MUESER
CONSULTING ENGINEERS

420 LEXINGTON AVENUE NEW YORK 17, N. Y.

Foundations for Buildings, Bridges and Dams;
Tunnels, Bulkheads, Marine Structures, Soil Studies and Tests;
Reports, Design and Supervision

Pardo, Proctor, Freeman & Mueser
Ingenieros Consultores
Ap. Correos 614, Caracas, Venezuela

WILLIAM H. MUESER, '22
GEORGE T. GILMAN, '23

PALMER RUSSELL CO.
Realtors

Real Estate Brokers *Property Management*
Appraisals and Mortgages

1320 BEACON STREET BROOKLINE, MASS.

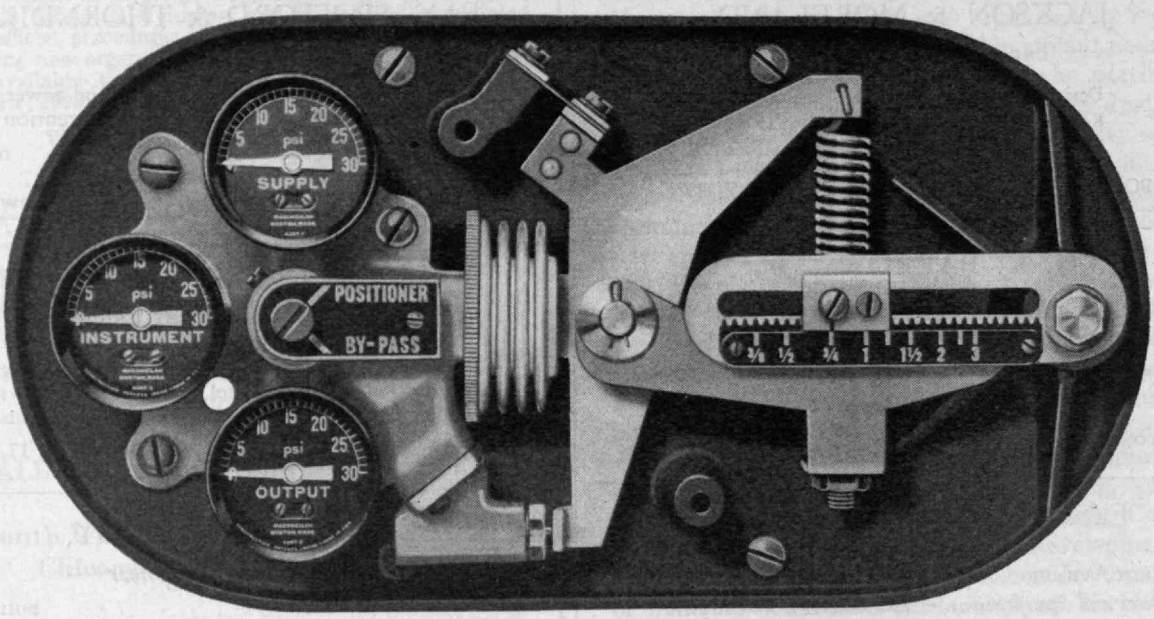
Edgar P. Palmer '25 William W. Russell '22

FAirmount 5105 EXpress 7766

FRANK MASSA
Electro-Acoustic Consultant

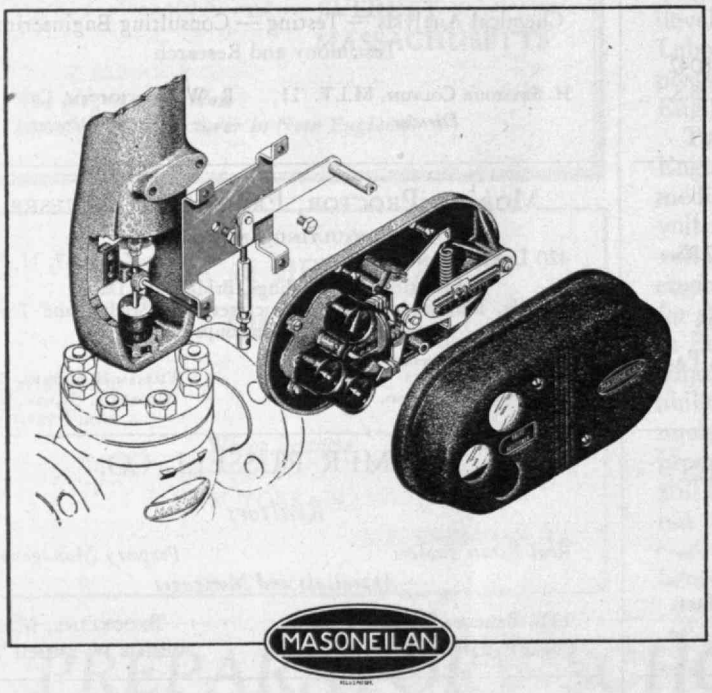
3393 Dellwood Road 3868 Carnegie Avenue
CLEVELAND, OHIO

NEW! 7400 SERIES

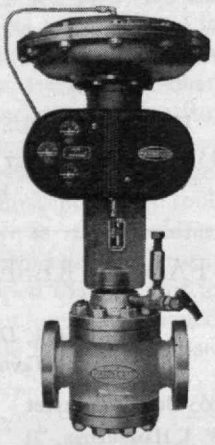


Interior View

CONTROL VALVE POSITIONERS



For use with diaphragm control valves or diaphragm motors — direct or reverse super-structure. For Split Range operation and Motion Transmission.



Positions the valve plug in exact proportion to changes in controller output pressure. Overcomes valve friction, pressure off-balance and viscous fluid effects.

MASON-NEILAN REGULATOR COMPANY

1190 ADAMS STREET, BOSTON 24, MASS.

New York • Buffalo • Chicago • St. Louis • Philadelphia • Houston • Pittsburgh • Cleveland • Tulsa • Atlanta • Los Angeles • San Francisco

Mason Regulator Company of Canada, Ltd., Montreal and Toronto

INCOME TAX DEDUCTIONS

"Is my Fund contribution deductible from Federal Income Tax?" The question arises periodically, and the answer is "Yes" with a qualification.

"Contributions to certain American charitable, religious, scientific, or educational corporations . . . no part of the earnings of which inures to the benefit of any shareholder or individual, are deductible for the year in which they are actually paid. The deduction is limited to 15 per cent of the adjusted gross income."

$ $ $

This, in essence, is that part of the Federal Income Tax law which is applicable to contributions made through the M.I.T. Alumni Fund. Contributions are made directly to the Massachusetts Institute of Technology, a nonprofit educational corporation. They are not made to the Alumni Association, which merely acts in the capacity of a collecting agency for the benefit of the Institute.

From each contribution, however, certain amounts are applied to other purposes. For your subscription to The Review, $3.00 is allocated. For the operation of the Alumni Association and the Fund itself, goes an additional amount of approximately $2.00, the actual figure not being known until after the end of the Association year, too late to be available for the tax year concerned. This amount is not for the benefit of M.I.T. and is not deductible.

In other words, all but $5.00 of your Fund contribution is a legitimate deduction in computing your income tax.

NEWS FROM THE CLUBS AND CLASSES

CLUB NOTES

M.I.T. Club of Albany

The Club held its first meeting of the year on October 17 at the Wellington Hotel with 18 members present. H. E. Lobdell '17, Executive Vice-president of the Alumni Association, was the guest speaker. Not only was his talk interesting but it evoked a very profitable discussion period concerning the Institute, the Alumni, and their mutual relationships.

Burt R. Rickards '99 has retired as Director of public health education in the New York state department of health. He is remaining in Albany, however, and maintains an active interest in this Club as well as the Institute. — GEORGE W. SCHAIBLE, *Secretary*, New York Telephone Company, 158 State Street, Albany, N. Y.

M.I.T. Club of Fairfield County

A group of approximately 25 Alumni from Fairfield County met on October 21 in Bridgeport for the purpose of acting as a steering committee in reviving the Club, which had been dormant since before the war. We were very fortunate in having as our guest H. E. Lobdell '17, who offered many valuable suggestions to guide the Club in its reorganization plans. At this first meeting the following officers were elected: J. Barton Chapman '35, President; Edward L. Wemple '34, Vice-president; Zay B. Curtis, Jr., '35, Secretary; and Jack Madwed '42, Treasurer. A resolution was presented and adopted that the Club should henceforth be known as the M.I.T. Club of Fairfield County. Considerable discussion was held as to how the Club could best serve the interests of the Institute in this vicinity, and tentative plans for furthering these interests were made.

It is anticipated that the first full-size meeting will be held sometime late in January or early in February of 1948, at which time we hope to have some prominent member of the Corporation present as a speaker. — ZAY B. CURTIS, JR., '35, *Secretary*, 421 Meadowbrook Road, Fairfield, Conn.

M.I.T. Club of South Florida

Club members who were anywhere but at 1827 Michigan Avenue, Miami Beach, on Wednesday evening, August 27, had only themselves to blame for missing a resounding good time at the Fred Zurwelles'. Barbecue time had come around once again. Soft breezes, gay lights, and tropical palms provided the perfect setting for a wondrous repast. With the barbecue came (and went) the fixings of potato salad, baked beans of which Boston might be proud, and salad. Topping it all off was apple pie. And present throughout was a variety of drink more than sufficient to satisfy.

The business portion of the meeting, conducted by President Tom Coogan '24, was short and productive. An unexpected highlight was the report by Ed Mandell '21 explaining his recent absences. Apparently, many obstacles, from courtrooms to trips north, were to blame. Better things are promised for the future. John Ostlund '35 had had no calls on his placement committee, and Alexis Kononoff '29 reported progress for his Engineers Club committee. Clarence Thayer '23 had an optimistic word in that three new members had signed up (and paid dues!) since the last meeting.

Prolonged discussion followed when the subject of future meetings was raised. Among the suggestions: a visit through the Miami *News* or Bell Telephone Company plants, a picnic at Crandon Park on Biscayne Key, excursions and fishing trips through the Keys, a call on the United States Sugar Company at Clewiston, and a jaunt around Dave Werblin's plant, wherein reinforced concrete joists are made. Al Taylor's committee is still looking for more ideas from one and all.

An encouraging number of postal card returns were received. Regrets came from James L. Kimball '85, at Marion, Mass.; Russell Nichols '09, at Shelburne Falls, Mass; John Ferguson '94, and Fred Anderson '04, vacationing in New Hampshire.

The following members attended: Charles Swift '99, Herbert Klipstein '14, Alfons Taylor '17, Henry Dooley '20, Morris Lipp '20, Fred Zurwelle '20, Edward Mandell '21, Coleman Jones '23, Clarence Thayer '23, Cecil Young '23, F. Cheng Chan '24, Thomas Coogan '24, Ruth Hampson Westbrook '24, John Dunbar '25, Richard O'Donovan '27, Alexis Kononoff '29, Foster Kennedy '30, Carl Orleman '31, Charles MacMillan '33, George McCaughan '34, John Ostlund '35, David Werblin '36, Bernard Ross '37, Irving Peskoe '39, William Sussman '40. — CLARENCE P. THAYER '23, *Secretary*, 4212 Northwest Sixth Avenue, Miami, Fla. IRVING PESKOE '39, *Review Secretary*, 2852 Southwest 22d Terrace, Miami 33, Fla.

M.I.T. Club of Northern New Jersey

The Club is having a number one meeting that is really a number one. The speaker, internationally famous, was the number one man in the South Pacific. MacArthur repeatedly said it was his superb direction of the air assault on Japan that made possible the island-hopping technique. He is now the number one man in the strategic air defense of our country and at M.I.T. a double number one man. You guessed it — General George C. Kenney '11 is the speaker and the topic, "Air Power Today," which is the number one interest. Since this subject is so close to our homes and loved ones, the meeting will be a ladies' night. They may bring their families and friends. It will also be a Class of 1911 get-together. Orville Denison '11 will be there for this 1911 reunion group. Make this a number one date on your calendar: Hotel Essex House, Newark, Thursday, December 4, at 6:30 P.M. — RUSSELL E. LOWE '16, *Secretary*, 112 Lincoln Street, East Orange, N.J.

M.I.T. Club of Philadelphia

On October 21 the University Club was found swarming with Alumni assembled for the fall meeting of our Club; and a representative group from most classes gathered around the punch bowl to renew acquaintances or to continue conversations where they were left off at our previous beer party. Greville Haslam '15 opened the formal session with impressions and comments gathered during his recent trip to England, where he was evidently treated royally. Upon the completion of Greville's talk, Dean Sherwood '24 told of recent changes in personnel and equipment at our school and gave a comprehensive picture of future plans, problems, and desires. The ever recurring need for funds was stressed once more, and the reasons for the need explained.

The following men attended this meeting: 1897: Wilfred Bancroft; 1905: C. A. Anderson, F. J. Chesterman; 1907: H. W. Mahr; 1908: James McGowan, Jr.; 1909: T. C. Merriman; 1912: C. L. Gabriel; 1913: R. W. Weeks, R. K. Wright; 1915: Greville Haslam, E. A. Whiting; 1916: E. A. Weissbach; 1917: J. Justin Basch; 1918: O. D. Burton, E. McE. Manter, W. R. Robinson; 1921: J. E. D. Clarkson, F. T. Flaherty, R. M. Shaw, Jr.; 1922: C. T. Chu, H. S. Dimmick, Joseph Greenblatt, C. W. Stose; 1923: E. J. Healy, R. L. Hershey; 1924: T. K. Sherwood; 1925: R. E. Cernea; 1926: K. S. Lord, J. A. Sweeton, F. E. Washburn; 1928: R. M. Harbeck, G. N. Janes; 1929: G. T. Logan, V. G. Miskjian, C. B. Wooster; 1930: W. H. Wannamaker, Jr.; 1931: H. S. Smith; 1932: C. D. Cummings, John Lawrence; 1934: M. E. Richardson, Proctor Wetherill; 1935: G. R. Bull, Jr.; 1939: W. F. Corl, Jr.; 1940: R. G. Gerges, D. E. Sunstein; 1941: C. W. Hargens, S. K. McCauley, J. S. Thornton; 1942: J. N. Evoy, Jr., E. W. Smith, Jr.; 1943: C. A. Hathaway; 1944: V. S. Ezykowski, R. G. Fisher, P. W. Wilder, Jr.; 1946: W. H. Peirce. — ROBERT M. HARBECK '28, *Secretary*, 605 Foss Avenue, Drexel Hill, Pa. *Assistant Secretaries:* SAMUEL K. MCCAULEY '41, 288 Copley Road, Upper Darby, Pa.; WILEY F. CORL, JR., '39, Box 532, Bryn Mawr, Pa.

M.I.T. Club of the Connecticut Valley

The Club assembled for the first dinner meeting of the 1947–1948 season at Club Silhouette on Longmeadow Street at the State Line in Longmeadow on October 15 at 6:30 P.M., with 65 members, wives, and guests present. At the head table were seated the officers — Al King '32, President, Bill Constantine '26, Vice-president, Thomas Hafer '35, Treasurer, Minot Edwards '22, Secretary — and the guest speak-

ers, Professor Charles Locke '96, Alumni Secretary, and H. E. Lobdell '17, Alumni Executive Vice-president. A steak dinner was enjoyed to the fullest, especially in view of the fact that the dinner price had been contracted for two months before inflation prices had advanced to present costs.

The President announced that the Vice-president, Basil G. Constantine, had been appointed club representative to the Alumni Council for the coming year and would attend the monthly meetings in Cambridge and report back to the Club at each meeting. The Secretary announced that the next meeting will be held on Wednesday, January 21, in the Sheraton Hotel ballroom and that President Compton will be our guest and speaker on the subject "Modern Applications of Atomic Power." The Western Massachusetts Engineering Society and the American Society of Mechanical Engineers and American Institute of Electrical Engineers combined will also attend that meeting.

After dinner an interesting and humorous talk by Professor Locke was followed by that of Vice-president Lobdell, who outlined everyday happenings at the Institute and the tremendous postwar problems occasioned by the inflated registration for the current two years. He discussed the new units to be built, including the projected library and the senior dormitory now under construction. At the end of his talk many of the members present asked questions, some of which Mr. Lobdell could not even answer himself. Ralph Curtis '15 then operated the movie and sound projector and showed three reels of travel pictures on the Carlsbad Caverns and Grand Canyon, lent by the Santa Fe Railroad.

Alumni present included the following: R. S. Bettes '44, B. G. Constantine '26, R. E. Curtis '15, J. M. DeBell '17, M. R. Edwards '22, W. A. Emery '21, Alfred Furtek '41, B. E. Geckler '05, S. E. Glick '41, P. P. Gooding '16, T. W. Hafer '35, H. D. Johnston '27, P. J. Joyce '41, John Kapinos '40, W. F. Kaufman '38, A. D. King '32, S. B. King '47, T. O. J. Kresser '34, R. D. Leonard '27, H. E. Lobdell '17, C. E Locke '96, W. G. Loomis '28, J. A. MacDonnell '32, R. J. Marlow '17, T. B. Oakes '38, C. W. Rieser '13, D. L. Ross '27, I. H. Small '28, J. R. Thompson '42, P. G. Volanakis '42, H. G. White '24, Alfred Ziegler '31, and numerous wives and guests. — MINOT R. EDWARDS '22, *Secretary*, Holyoke Heater Corporation, 54 Waltham Avenue, Springfield 9, Mass.

Washington Society of the M.I.T.

The October 9th meeting of the Society at the Y.W.C.A. was the first appearance of Al Beitzell '28 as president. After dinner he asked his staff and executive committee to stand, for identification of the new men. Since the Community Chest campaign is just around the corner, we heard a short pep talk from a Chest speaker. Charles D. Wheelock '23, a rear admiral in the Navy, presented an address picturing how absorbing the life of a naval architect and engineer can be. He said his work is fun and a thrill as he serves as deputy chief of the Navy's Bureau of Ships. Surface ships will endure, said the Admiral, because of heavy movements of goods. Surface cargo ships will always need surface warships to guard them. There used to be a time when one man could know all there was to know about a ship. Now this is impossible because a warship is a floating city with shops, soda fountains, engines, telephones, radio set-up, and all the rest. The best a bureau chief can do is to train and supervise a team of specialists in each of the scores of fields. Admiral Wheelock spoke of balancing the enthusiasts. The ordnance men want a ship to be all guns, the naval architects want sleek lines and speed, the arrangement men want all compartment space, the engineers want all machinery. Balancing these requirements into a buildable ship is where the admiral gets his fun. There is a tremendous field for new development and perfecting of old devices. In late years the growth of welding, the additional speed of ships, new navigational devices, and new sound detection devices are a few of the factors that make naval architecture a modern and exciting profession. The fellows could not help but feel confidence in the Bureau of Ships with Admiral Wheelock in charge. After the talk a Navy documentary film reviewed headline memories of naval fighting in the Pacific.

Present were: 1890: J. G. Crane; 1892: B. P. DuBois; 1893: P. H. Thomas; 1897: P. L. Dougherty; F. A. Hunnewell; 1903: W. L. Cook; 1904: G. N. Wheat; 1907: J. P. Alvey; 1909: B. A. Robinson; 1911: C. P. Kerr; 1915: A. D. Beidelman; 1916: F. P. Upton, W. E. Wentworth; 1917: H. M. Baxter; 1918: H. D. Manuelian; 1919: L. J. Grayson; 1920: W. M. B. Freeman; 1921: Richard McKay; 1922: W. K. MacMahon, R. K. Thulman; 1926: S. J. Cole, J. G. Fletcher; 1927: A. J. Reardon; 1928: A. E. Beitzell, G. D. Mock; 1929: N. P. Stathis, J. A. Plugge; 1930: J. R. Bloom, A. F. Bird; 1932: W. S. Clark, Lester Glickman, F. M. Moss, R. W. West, R. J. Zampell; 1938: Will Lyons; 1941: R. A. Frigon, M. J. Block, E. F. Lawrence; 1944: W. C. Sadler; 1946: G. B. Devey. — JOHN A. PLUGGE '29, *Secretary*, 35 Oxford Street, Chevy Chase, Md. ALBERT F. BIRD '30, *Review Secretary*, 5070 Temple Hills Rd., S.E., Washington 20, D.C.

CLASS NOTES

1888

The New York *Times* gave the following account of Frank Meade, whose death was listed in the July issue of The Review: "Frank B. Meade, dean of Cleveland architects, who drew plans for 800 homes, country clubs and office buildings in Greater Cleveland during his career, died [on March 22] at the age of 80. After attending the Case School of Applied Science and . . . Technology, Mr. Meade worked for a local architectural firm and then went to Chicago, where he helped design some of the buildings of the Columbian Exposition in 1893. On his return he was associated with Alfred Hoyt Granger and later with Abram Garfield and James M. Hamilton. In 1904 he and a group of friends who shared his love for music organized the Hermit Club, and Mr. Meade was its president for thirty-five years. He was a member of the Cleveland Group Plan Commission and later of the City Plan Commission. He leaves a widow, the former Dora Rucker, whom he married forty-six years ago, and two sisters."

The *Times* also reported the death of Savory Hathaway, as follows: "Savory C. Hathaway, who was formerly with brokerage and mill firms [in New Bedford, Mass.] died [on August 15] in St. Luke's Hospital after a brief illness. His age was 83. He was a son of the late Savory C. Hathaway and Sophronia W. Bourne Hathaway. His father started the old Hathaway, Soule and Harrington shoe-manufacturing business here. Mr. Hathaway was graduated from Technology in 1888 and was formerly in the shoe business in Springfield, Ohio. He leaves a widow, the former Gertrude E. Shaw; a brother, Alvan B., of Boston; a sister, Mrs. Mary B. Farnum, also of Boston; a niece and two nephews."

An Exeter, N.H., paper has some very good words to say editorially of Arthur Conner, who died on August 30 in his 80th year: "Exeter owes much to the late Arthur J. Conner, and it is fitting that recognition be made of his many good deeds. In life he was very careful as far as possible to keep his gifts and his connection with charities from public attention. Many of us are unaware of much that he did. He was particularly interested in underprivileged children. He would give the American Red Cross nurse and school nurse, in Exeter, Julia McQuade, liberally for shoes, clothing, and eye attention for such of the school children as were in need of help, and for many years he furnished free milk at the schools for those who were unable to pay for it. He would pay the expenses of a number of deserving boys for several weeks' outing at the Y.M.C.A. Camp Lincoln on Kingston Pond. He was a member of the Lions Club, and on Christmas holidays he was active in the Lions Club Santa Claus party for children at the Ioka Theatre, and he provided the much-sought-for packages of candy which were given the children as they left the theatre. Years ago, when he found Miss McQuade had to attend her calls on foot, he provided her with a car, and he periodically had it replaced with a new one.

"He gave the town the land on Center Street next to the Telephone property, for a parking lot which is now serving a most useful purpose. He gave the Exeter Public Library the fine fireproof safe which now contains the files of THE EXETER NEWSLETTER. He gave liberally to the Congregational Church of which he was a member. It was largely through his energy and under his direction that the funds for the 'Parish House' addition to the church were raised in 1929 and he contributed largely to this project. He gave the carpet on the aisles in the church and paid for the expensive redecorating of the ceiling. For a number of years he provided for special Christmas and Easter music, and he helped in paying for the new pew cushions, and in many other ways he assisted in the support of the church.

"Several in Exeter who were in need of special medical or surgical treatment, but were unable to afford it, were placed on the road to recovery by Mr. Conner's generosity. He contributed liberally to . . . Technology from which he graduated, giving the Arthur J. Conner Fund.

"For a number of years he was a member of the town's budget committee, serving for some time as chairman, and Exeter profited by his financial knowledge and

experience. His logical mind and his ability was recognized and his advice sought for at Concord when he was representative to the General Court and also when he was state senator. He was always loyal to his friends though at times his ideas may have differed from theirs. Exeter will miss Arthur Conner."

Our Assistant Secretary wrote as follows, in September: "We have been celebrating the Brae Burn Country Club's golden anniversary this past week. Yesterday I won an individual trophy in the bowling-on-the-green contest, involving 24 participants. I had to play it off with the youngest player, a girl of about 17, with whom I was tied; but I won from her also and have a nice silver plate. Last year, as I told you, I won a putting contest at Wambeck, Jefferson, N.H., but I have still to look forward to the other sports — golf, tennis, baseball, and football — in which I have so far failed to make a showing."

Your Secretary, meanwhile, has distinguished himself by being promoted to fellowship in the American Society of Mechanical Engineers. — BERTRAND R. T. COLLINS, *Secretary*, 291 Nassau Street, Princeton, N.J. SANFORD E. THOMPSON, *Assistant Secretary*, The Thompson and Lichtner Company, Inc., Park Square Building, Boston 16, Mass.

1889

Our classmate Kinsley Dunbar died on August 18. The following account of his life is from the Wellesley *Townsman:* "Kinsley Dunbar, of 33 Ingraham road, Wellesley, died in Scituate on Monday, August 18, after a long illness. A graduate of M.I.T., he was a construction engineer during his active career. He came to Wellesley three years ago from Brookline and previously was a long-time resident of Canton. . . . Besides his wife, Mrs. Anna M. (Hewitt) Dunbar, he leaves a daughter, Mrs. R. G. Sykes, both of Wellesley, and a brother, Oliver Dunbar, in Canada."

The Secretary has received an entertaining letter from Zenas Bliss, which closes with the following two paragraphs: "As you know, I have not been for some time what one trained in the exacting school of applied science would term active; but about a year ago I definitely and officially retired and gave up my office, which I had maintained for something more than half a century with considerable enjoyment and occasionally with a small profit. Now my principal desire and activity is to prevent myself from being a nuisance about the house and in the immediate vicinity of my humble abode. I no longer haunt the marts of trade, and they return the compliment and no longer bother me. My ability to loaf on the slightest provocation has been well known for many years, but lately I have developed it to the *n*th degree, and in order to make it pleasant as well as easy I am planning to go South for the winter, starting late in November. I trust all goes well with you. . . ." The Secretary hopes that Zenas will not loaf so hard as to prevent his writing again, now and then, just to keep us posted.

Welles Bosworth broadcast through the French Radiodiffusion on June 10 about the little Normandy town of Vimoutiers, destroyed by American aviators as a result of fraudulent information by the Germans. Welles has been active in raising a fund which amounted to $41,666 to help in its restoration, and he reports that although the town was practically destroyed and 218 persons killed out of a population of 3,000, no resentment is felt against the Americans, "but only gratitude for driving out the German slavemasters." — L. E. Johnson is now at Lake Court Apartments, West Palm Beach, Fla. — WALTER H. KILHAM, *Secretary*, 126 Newbury Street, Boston 16, Mass.

1891

The Alumni Association sent us a newspaper clipping telling of the sudden death of our classmate Hartley White at Pembroke, Mass., on September 20. He attended our 40th reunion, but apparently we have not seen him since then, although he has written us at various times. A few years ago he bought a small but attractive home with fruit trees on a small lake in Mount Dora, Fla. He sent us some pictures, and we understood that he intended to make this his permanent home. The next we heard, he was back in Pembroke, Mass., and according to his letters, he was not moving around much, if any. He was Norfolk County engineer for many years and lived in Braintree, Mass., where he was active in local affairs. Charlie Locke '96 writes that Professor Hayward thought highly of White, especially his work in Masonry, and that "he gave lectures in a most impressive manner."

The following is from the Quincy, Mass., *Ledger*: "Mr. White, who was born in Holbrook, had lived most of his life in Braintree. He was a member of the Masons for more than fifty years, serving as master of the Rural Lodge of Quincy from 1906–1908; first master of the Manet Lodge of Quincy in 1922; and district deputy grand master of the 26th Masonic district in 1910–1911. A graduate of . . . Technology, he was county engineer from 1923 to 1938. He was a charter member of the Braintree Rotary Club, a member of the Braintree Chamber of Commerce, and active in community organizations and committees. Mr. White's first wife, Mrs. Grace (Emery) White, died in 1937. He leaves his second wife, Mrs. Rebecca J. (Janes) White, a daughter, Mrs. Grace W. Wilson of Weymouth, a son, Gordon White of Hanson, and three grandchildren."

In our last notes, we mentioned the visit east of Ernest Hersam. On his return to his home in Berkeley, Calif., he wrote Ernest Tappan as follows: "I feel moved and grateful for your thought of me after our conversation and the happy hours together that we had under your kind hospitality. Our automobile journey was four months long, and took us 17,000 miles into Maine and Canada and all our own states except the extreme southern ones, which we thought would be too hot to be comfortable at that season. It is good to be at home now for awhile, but the trip was very pleasant, and conditions for travel were propitious all the way, going and returning. Be sure when you again come west to give me a telephone call, and a visit if you can, at my home in Berkeley. Kindly extend to Young my remembrance and happiness, for our fine noonday hours and luncheon with him in Boston."

The Portland *Telegram* of October 12 has a picture of our classmate Joe Warren with the following comment: "The new $50,000 Presumpscot Fire Station at Westbrook, Maine, was dedicated today when Joseph A. Warren, an official of the S. D. Warren Company, delivered the deed to the property to Fire Chief, C. G. McAloney. The dedication followed an inspection of the building by Westbrook citizens and was concluded by a supper in the Legion Memorial Home attended by guests, civic leaders and members of the Fire Department. Chief McAloney said the building, which will be occupied by Engine 1, was started in September of last year. Among the speakers at the ceremony was Oliver T. Sanborn, Portland Fire Chief, who discussed methods of Fire Prevention." — HENRY A. FISKE, *Secretary*, Grinnell Company, Inc., 260 West Exchange Street, Providence, R.I.

1893

Nineteen members of the Class, including J. B. Baxter, J. B. Blair, S. A. Breed, L. B. Buchanan, H. N. Dawes, C. E. Fuller, G. B. Glidden, F. H. Keyes, W. F. Lamb, H. M. Latham, F. W. Lord, E. I. Leeds, Edward Page, E. S. Page, A. S. Pevear, C. M. Spofford, C. M. Taylor, and J. F. Tomfohrde attended the luncheon meeting at the Engineers Club in Boston on June 4. As stated in the call for this meeting, the principal item of business was the election of officers to fill vacancies caused by the death of our former President, Fred Dillon. In accordance with the recommendations of the nominating committee, and with the unanimous approval of those present, H. M. Latham was elected president and L. B. Buchanan first vice-president, together with Dawes, Spofford, Glidden, and Keyes continuing in office as second vice-president, treasurer, assistant treasurer, and assistant secretary, and secretary, respectively. After a brief discussion of what might be done next year, on the occasion of our 55th anniversary, George Glidden was chosen chairman of a committee to make whatever arrangements may be necessary, depending on suggestions from the Class as to the most desirable time and place to hold the meeting. Preliminary investigations, already undertaken, indicate the advisability, if not the absolute necessity, of engaging whatever accommodations may be required well in advance of the event itself.

With reference to the Alumni Fund, a few generous contributions have made it possible for us to exceed our quota during the past two or three years, but what we need now is a greater number of average contributions to make up the total amount of our allotment. As class agent and from my point of view here at the Institute, I believe our continued support of this well-established undertaking is one of the most helpful things that can be done for Technology. — FREDERIC H. KEYES, *Secretary*, M.I.T., Room 7–211, Cambridge 39, Mass. GEORGE B. GLIDDEN, *Assistant Secretary*, 551 Tremont Street, Boston 16, Mass.

1895

Now we know where the "'95 Twins" are. Gerard Hendrik Matthes and François Emile Matthes were (and still are) the famous twins who looked alike, walked alike, and took the same Course I while at Technology. Gerry beat his twin brother in laying down his life work by retiring in 1945, and may be found at the Broadway Cen-

tral Hotel, Suite 518, New York City, according to last report. He has written that François never knew when to quit, but we finally have word of François' retiring from the United States Government Geological Survey after a continuous service of 51 years.

François E. Matthes is now living at 858 Gelston Place, El Cerrito, Calif., and we have yet to learn what hobby he will pursue to occupy his well-earned rest. He began work for the United States Government in 1896, with the Geological Survey as field assistant on topographical surveys. His work included surveys of Cloud Peak Quadrangle, the Big Horn Mountains in Wyoming, the Glacier National Park District in Montana; the Grand Canyon of the Colorado in Arizona, the Yosemite Valley in California, the Mount Rainier National Park in Washington. He served on the California Earthquake Investigation Commission during 1906. He also studied the physiographic history of the central Sierra Nevada, with special reference to the problem of the origin of the Yosemite Valley. His work has been mostly in the western states, which he knows intimately. We quote from a letter in which he states, "My experience and adventures in the Far West have been most interesting. My Technology training has been everything to me; still, in the perspective of many years, it compares most favorably with the equipment that most men in my profession bring from other schools." — LUTHER K. YODER, *Secretary*, 69 Pleasant Street, Ayer, Mass.

1896

Myron Fuller wrote that he was leaving on October 13 for his usual winter stay in Florida at Fort Myers, after having had a pleasant summer in his bungalow on their pond at Easton. He had two camping trips of a week each, the first at the High Point State Park (elevation: 1,600 feet) in the northwest corner of New Jersey, and the second near the foot of the Sandwich Range at a pond in Tamworth, N.H. The Florida hurricane went almost directly over Fort Myers, blowing down about a thousand trees, mostly palms, wrecking at least one building in town, and burying several automobiles in the debris. The roof of the smaller of Myron's houses, which was metal, was rolled up, but only a tile or two was blown off the larger house. The damage, which was not great, was fully covered by insurance. On his way to Florida, he was planning to drive over new roads wherever possible, going over the high, barren plateaus of northern Pennsylvania, then through the mountains of West Virginia, and finally following the Piedmont of North Carolina and states to the south. His winter address is 4 Rhode Island Avenue, Fort Myers, Fla.

On October 13, the Secretary had the pleasure of a call from Lloyd Wayne, who was prevailed upon to stay to lunch. He had driven on from Indianapolis in his car to spend a week in Boston visiting relatives and attending the convention of the Telephone Pioneers, of which he is a member.

A high honor has come to Harry Baldwin. The City of Hartford, on the occasion of the Hartford Golden Jubilee held in September, presented him with a metallic plaque on which the inscription read, "The City of Hartford honors Henry S. Baldwin for the part he played in establishing and developing the United States automotive industry. Hartford Connecticut Golden Jubilee, September 1947." The presentation was made to Baldwin, among others, at a dinner held under the auspices of the Hartford Chamber of Commerce for members of the Society of Automotive Engineers in commemoration of the birth of the automotive industry 50 years ago. The dinner was attended by leading citizens of Hartford, as well as the group about to start on the Glidden Tour to the White Mountains. The industry, which was established in 1897, when Colonel Albert A. Pope founded the motor carriage department of the Pope Manufacturing Company, was joined by Baldwin in the early part of 1897 as engineer and designer. He worked on a number of early gasoline cars, as well as storage battery and other types of vehicle in those early days. Later, he joined the General Electric Company in Lynn and was associated with the late Professor Elihu Thomson for a number of years in the development of a high-pressure steam automobile. He was then made chief of the automobile division, retiring in 1938. He is to be credited with the invention of demountable auto wheels now universally used. During World War I, he was detailed by the General Electric Company to design and develop for the United States Army the first gas-electric driven armored tank, which was built under his direction in Peoria, Ill., at the Caterpillar Tractor Company Works. He was also engineer associated in designing and developing a mobile field unit for the powerful 60-inch field searchlight, as well as an 80-ton gun mount for a 240-millimeter mechanized field gun.

Charlie Cummings has now moved to Prides Crossing, Mass. Bradley Stoughton, now retired from Lehigh University, is located at 140 East Market Street, Bethlehem, Pa. Leebert L. Lamborn has changed his address to 26 Humboldt, Cuernavaca, Morelos, Mexico.

Charlie Stamp, whose troubles with salt brine in the pump handling the brine from his water softening operations were reported here last month, has now written that it looks as if his problem had been solved by thoroughly flushing out the pump with clean fresh water after every periodical removal of brine.

Further details regarding Arthur Baldwin's death, which was widely noted in New York and Boston papers, are now available. He had gone to France early in September and was visiting friends in a Paris suburb when his death occurred suddenly at their home on September 27. He had written his son that he had a wonderful trip flying to Europe and was very happy to be able to visit many of his old friends. He was due back on the *Queen Elizabeth* on October 11. His villa in France had been sold previously. His son reported that the body was to be cremated after a memorial service in Paris and later another memorial service would be held in Virginia. Arthur was one of the outstanding men in our Class from his student days through his entire career with the General Electric Company. After his graduation he took the test course with the company, and on completion of the course he was assigned to the general office. In 1898 he was transferred to the foreign department, of which he became assistant manager in 1912. Upon the formation of the International General Electric Company in 1918, he was named manager of the European division; and in 1927 he moved his headquarters from Schenectady to Paris, where he had charge of the company's affairs in France and throughout southern Europe. He was made a vice-president in 1938. Upon the outbreak of the war, he was returned to this country, and not long afterward retired. He was a former president of the American Chamber of Commerce in Paris and an officer of the Legion of Honor. Harry Baldwin has well expressed the feeling of the Class when he wrote, "We shall meet but we shall miss him; there will be a vacant chair." — CHARLES E LOCKE, *Secretary*. Room 8–109, M.I.T., Cambridge 39, Mass. JOHN A. ROCKWILL, *Assistant Secretary*, 24 Garden Street, Cambridge 38, Mass.

1897

Edwin R. Motch, II, died in Cleveland, Ohio, on June 8. Further details are not as yet available. We had hoped to have Ed with us at the East Bay Lodge reunion as he had attended some of our earlier reunions in Osterville. He had long been a member of the Motch and Merryweather Machinery Company of Cleveland, Ohio, dealers in machine tools.

William C. Ewing, VI, died on May 9 at his home in Williamsburg, Va. He is survived by his widow, Florence Wood Ewing (also M.I.T.'97), VIII, one son, Dr. Galen W. Ewing, professor of chemistry at Union College, Schenectady, N.Y., and one brother, Rev. Addison A. Ewing of Philadelphia. For some years after graduation, William was with the civil engineering firm of C. H. W. Wood Company of Roxbury, Mass. He later became superintendent of the Wells Memorial Institute in Boston, a workingman's club and school. At the time of World War I he was called to Washington as special expert in the division of planning and statistics of the United States Shipping Board. At the close of the war his interests turned to community organization. With the American City Bureau he traveled over the eastern United States organizing chambers of commerce in various cities, eventually going to Williamsburg, where he took up his permanent residence. In 1937, he purchased the "Cole Shop" and operated it as a book and print shop that became a popular gathering place for college professors, students, townspeople, and tourists who were book-lovers. He was intensely interested in the colonial history of Virginia, and Williamsburg in particular, and published a map of the colonial town in addition to a guidebook of the present town. A particularly sad feature of his death was that he and Mrs. Ewing had planned to come on to Boston for the 50th reunion of the Class. The deepest sympathy of the members goes out to Mrs. Ewing in her loss.

Charles B. Paine, IV, died in Concord, N.H., on July 10, 1945, according to advices recently received. We have been apprised of the sudden death on June 14 of Julie Kimball Everett Satterwaite, widow of Frank W. Everett. Many of the members of the Class knew Mrs. Everett while Frank was living and will remember her well.

On June 25 one hundred representatives of the wool trade gathered at the Algonquin Club in Boston at a luncheon given to Walter Humphreys in honor of his 25th anniversary as secretary-treasurer of the National Association of Wool Manufacturers. Arthur Besse, President of the association, acted as toastmaster and introduced three speakers, Willard Bigelow, Secretary of the Boston Wool Trade Association, T. B. Hayward, President of the Philadelphia Wool and Textile Association, and Franklin W. Hobbs'89, chairman of the board of directors of the William Whitman Company, Inc. Mr. Humphreys was praised by all for his work for the association and was presented with a silver tray. Franklin W. Hobbs was chairman for arrangements.

Already has Death begun to take its toll from those who were at the 50th reunion of the Class at Osterville in June. Chester D. Hubbard, VI, died in Marshfield on October 4, aged 73 years. For a number of years previous to his retirement, he was connected with the shipbuilding division of the Bethlehem Steel Company in Boston. — Frederic N. le Baron, IV, died in Wollaston, Mass., on September 23. For 25 years he was president of Peterson and Neville, Inc. (steel), of Boston. During World War I he was supervisor at the Victory plant of the Fore River Shipbuilding Company in Squantum, and during World War II he served on the advisory board of steel experts of the United States Navy. He was a member of the Society of Mayflower Descendants. He leaves his widow, Mrs. Lavina S. le Baron. — We must also record the passing late in September of Frank E. Mansfield, I. No other details are available at this writing. He had been connected with the Farrington Manufacturing Company of Jamaica Plain, Mass.

Earlier in the year, E. P. Osgood, XI, writing from Reno, Nev. (now, do not be alarmed by his address — he states that he is living with his one and only wife), says that he and his youngest son are operating under the name of Osgood and Osgood. They are busy developing greasewood and sagebrush environs, still carried on the tax rolls as "mountain range" land at $1.50 an acre, into $2,000 to $7,000 properties, including some "dude ranches." During the war he was employed on various government projects such as the Nevada Air Base at Tonopah and Fallon, the Herlong Ordnance Department in California, the Federal War Housing in Alameda, Calif., and the Oregon airfield of the Civil Aeronautics Administration at Port Orford. Ed is much interested in economics, and suggests that Dr. Compton establish a course in social science. Ed's creed to solve all our present business troubles is to "balance the budget of business, guarantee buying power by democratic government that would maintain it when and while industry would not." He is seriously thinking of writing a book on "The System (Capitalism) That No One Knows, or the Dynamics of Economics." We'll watch for it, Ed, and hope it will offer a solution to all our problems of living. — JOHN A. COLLINS, JR., *Secretary*, 20 Quincy Street, Lawrence, Mass.

1898

The 50th reunion is rolling. Lester writes that as of October 27, he has received 65 "Yes" cards. This is wonderful! One-third of the Class, and eight months before the event! But, you say, what about the other two-thirds? Why not make it unanimous? Well, that is where you-all come in. These notes are written a month before publication of The Review, and in the meanwhile you will have received the program for the reunion. Lester and George Cottle are working like beavers to make this reunion memorable. Let us one and all back them up in every way possible.

Our former Class President and Secretary, C.-E. A. Winslow, has been hard at work since his retirement from active service at Yale University. Read the following from an article published in the *News* of Springfield, Mass., on June 10: "Dr. C.-E. Amory Winslow, professor emeritus of public health at Yale University Medical School and internationally known for his work in public health for many years, has arrived in Springfield to study health facilities and services in this area. His study is part of the Springfield Community Survey sponsored by the Community Chest and the Council of Social Agencies and financed by the Eugene A. Dexter Charitable Fund. It will cover the health programs of the Springfield Health Department as well as programs conducted by the health departments of West Springfield, Longmeadow, East Longmeadow, Agawam and Wilbraham. Health programs in schools, the Hampden County Tuberculosis Association, the Western Massachusetts Society for Social Hygiene will be studied. Red Feather services such as the Children's Study Home, the Visiting Nurse Association and the Nutrition Service Bureau will be included in Dr. Winslow's extensive survey to determine the health needs of the people of this area, whether present services are meeting those needs and what changes may be recommended to improve them."

Dr. Alice Weld Tallant of 2008 Walnut Street, Philadelphia, has attained well-merited fame in her chosen field of medicine and writes the following interesting letter: "After practicing for two years in Boston, my old home, I came to Philadelphia in the fall of 1905, to take the chair of obstetrics at the Woman's Medical College of Pennsylvania; I was professor at the college and chief obstetrician at its hospital for 18 years, leaving there in June, 1923. I was attending gynecologist and obstetrician on the staff of the Philadelphia General Hospital, which corresponds to the Boston City Hospital, from 1922–1928 inclusive; that meant three months of service each year. In 1926 and 1927, I was medical officer in the Children's Bureau (Washington); my work was to make a tour of the states of Kentucky and Oklahoma, spending a month in each state, giving talks and demonstrations on the subject of obstetrics to the physicians in the country areas. Having directed an outpatient obstetrical service at the Woman's Medical College and done obstetrical work in the devastated regions of France in World War I and after the armistice, I had fortunately had many experiences which were akin to those of the physicians whom I met, so that we could often 'swap' stories. I came away with a great respect for the work which these doctors were able to accomplish amid such great handicaps; I hope that I was able to give them a little practical help. In 1924, I started an outpatient obstetrical service at the Babies' Hospital here, and was its director for 18 years, till 1942.

"Since then I have had no definite hospital service in obstetrics, but as it is far and away my favorite branch of medicine, I still practice it rather actively; I also do gynecology (not operative, except in minor cases) and a little general practice. Since 1928, I have been the physician in charge of the church dispensary of Southwark, which is held at a settlement called St. Martha's House. This is in what is called South Philadelphia, a section which has seen many foreign immigrants; in our particular part the majority of the people are of Italian stock, some of whom (usually the older ones, of course) speak little or no English. I have learned to speak a fair brand of Italian, which might not pass muster with a college professor but is quite understandable by our patients. I think that some of them come because I can speak Italian. This is a general clinic, serving all ages from 10 days to 80 years, and the daily number of patients runs from 20 to 40; I hold the clinic twice a week. We also have a clinic for children, which we call a corrective clinic, as it is intended, not for sick children, but for the correction of various defects and for a means of follow-up examinations on school children. It is held in the afternoon directly after school hours, so that the children can easily come in, without losing time in school. I have an idea that they consider it in the light of one of the clubs which the House maintains, as they sometimes ask me whether a friend may "join." In the summer I examine children and grownups for various vacation camps, etc., and in the winter I examine the children in the settlement kindergarten.

"As for my nonmedical activities: I am on the board of a home for old people and am a member of the house committee and chairman of the health committee (which makes me automatically one of the executive committee of the board). Although the home is a small one (having about 26 residents), my duties seem to take time, not only because of the meetings of board and committees, but because I like to visit the home three or four times a month to keep in touch with our guests and their problems. Almost ever since World War I, I have been active in the Women's Overseas Service League, comprising women who served overseas in that war; I have even been president of the local unit and am now treasurer of an emergency fund for members who may need financial help. As a loyal Smith graduate, I have been a member of the Philadelphia Smith Club ever since I came here to live; I have been president and alumnae councilor and for many years chairman of the nominating committee (indeed, I am familiarly known as the "permanent nominator"). Although I am pretty nearly the "oldest inhabitant" in the Club, I seem to have become a tradition for interest in it, and the young members are as nice to me as if I were one of their age. This is one of my most rejuvenating experiences! I might add that I am rather devoted to my church (the First Unitarian) and belong to its women's organizations as well as to our book club, and the church committee, of which I am chairman.

"Although my office is in town, I live in Germantown, in a little house on the grounds of some good friends, where I have the advantage of their lovely garden and lawns and trees and also have a garden of my own. Indeed, that might be considered one of my hobbies. I always expect to spend a good part of my summers digging plantains and crab grass out of my lawn. I am not an expert housekeeper and am lucky in having a maid in this day and generation. But I have always been able to make fudge, ever since I learned at Smith, and I make *pounds* of it for our Overseas booth at the big Christmas bazaar and our church fair."

We regret exceedingly to be obliged to include in the class notes the following notice from the Boston *Globe* of August 5: "William E. Putnam, 74, architect, who designed a number of prominent Boston buildings including the Boston Athenaeum and the Hotel Bellevue, died [on August 4] at the Massachusetts General Hospital. Putnam was only a young architect when, in partnership with Allen Cox, he won the contest for the design of the Athenaeum in 1902. His partnership with Cox continued until the latter's death in 1944. For the past year he had been a member of the architectural firm of Putnam, Griswold, Wylde and Ames, 53 State St. Mr. Putnam was born in Newton Center, the son of the late William E. Putnam, president of the Boston Safe Deposit Bank. He prepared at the Chauncey Hall School, Boston, received his A.B. at Harvard in 1896 and his B.S. degree at M.I.T. in 1898. Besides the Athenaeum [a proposed building never built] and the Hotel Bellevue, he designed the American Unitarian Association headquarters, Beacon St.; the Angell Memorial Animal Hospital, Brookline; the Lord Jeffrey Inn, Amherst, and many of the fraternity buildings at Amherst and Mount Holyoke Colleges. During World War II he spent three years in radar research at Harvard. He was a member of the American Institute of Architects, the Boston Society of Architects and the Massachusetts State Society of Architects. He was a director of the M. S. P. C. A. and the American Humane Society. He was a former member of the Union Club of New York, the Harvard Club of Boston, the Faculty Club at Harvard and The Country Club." Willy Putnam was with us at the get-together at the Algonquin Club last June. He was planning to attend the 50th. We shall miss him and remember his genial personality.

Paul Wesson called the other day, and we had a delightful visit together. After commencement in 1898, Paul worked for 15 years in Lowell. He then went to the Eastman Kodak Company, with which he has been associated ever since until his retirement about a year ago. He related unusually interesting experiences concerning the manufacture of films during the recent war. Since his retirement he has been traveling extensively with his wife. Thanks, Paul, for the visit. *Entre nous*, remember the promise!

The wanderlust seems to have struck '98. Alvan L. Davis of 25 Concord Street, Waterbury, Conn., writes, "I find this (the invitation to the '98 get-together at the Algonquin Club last June) upon my return after some months. I shall try to get to the 50th reunion next year. Will try to send you a memorandum of our western trip before then, but it is hard to get down to writing, and I am a hardened sinner in that respect."

F. F. Colcord, Vice-president and consulting engineer of the United States Smelting, Refining and Mining Company, was retired last July and ever since has been touring the country and leading the life of Reilly. We shall expect a full description, whenever Frank settles down long enough in one place!

George and Mrs. Treat left Boston about the middle of October, heading for California for a month or so. We wish the Treats a very pleasant vacation trip and much benefit therefrom.

The Secretary-Emeritus and the Secretary had a golf game the other day. Can that man Blanchard putt! Look to your laurels, ye who would be prize winners in the golf competition at The Country Club next June!

And now we will conclude the class notes for the year 1947 by wishing all the boys and girls of '98 a very merry Christmas and a very happy New Year — and hoping to see you all next June at the 50th. — EDWARD S. CHAPIN, *Secretary*, 463 Commercial Street, Boston 13, Mass.

1900

Charlie Smith thoughtfully wrote in about his trip around the Cape district, and says of it: "I know you will be happy to learn that I had a visit with Louis Crowell at East Dennis when I spent a week end at Oyster Harbors. I drove over to East Dennis, and his daughter recognized me immediately, but Lou was out fishing; so we drove on down to the beach and caught him coming in with a big bass and a very short remark about one that got away and took his line. I remarked, 'It must have been a big one,' but Lou is not one to brag. He looks very well indeed — as well in fact as when he licked the tar out of me on the Oyster Harbors golf course two years ago. I also discovered something new. A cocktail made of cranberry juice and Southern Comfort is a wonderful drink, especially when looking into a pair of sparkling brown eyes. Just before we left, his daughter Lydia arrived and further flattered me by recognizing me immediately. On my return trip, I stopped at Dick Wastcoat's house at Taunton, but unfortunately for me he had gone to drive himself. His housekeeper told me that Dick is improving rapidly, takes an automobile ride every afternoon, and has been attending some business meetings lately. While I was sorry to have missed Dick, I was very happy to hear some good news of his improvement. I hope you and Marion are well."

Dick Wastcoat sends us the following card, and we are all glad that he is recovering so well: "Charlie Smith dropped in to see me one Sunday afternoon. I was out riding, which means that I missed him. I am coming along very well. I go to drive every afternoon, have attended three bank directors' meetings, have been to the shop, and also conduct business from my front veranda. Nurses are still holding my hand but for a different reason now. My best to all."

A very welcome letter came in from George Russell, reading as follows: "It was nice to chat with you, and I am glad you came through the operation all right. Your strength will come back gradually, I am sure. Keep out of doors all you can before the weather turns cold. This is what Jean preaches to me, but I fear I don't practice it so well as I should. My heart's best wishes go with this." — C. BURTON COTTING, *Secretary*, 111 Devonshire Street, Boston 9, Mass.

1901

A post card from Joe Evans from Buzzards Bay, Mass., reads as follows: "I left Omaha on May 23 to attend my 50th class reunion at Phillips Exeter Academy, Exeter, N.H. The administration extended us free hospitality for three nights and days. Exeter won over Andover at baseball — 7 to 3. I attended the M.I.T. Alumni luncheon and banquet on June 14 and was the only '01 man there. I wonder where the Boston '01 men were. Spent three weeks from July 9 in Canada on Lake Champlain where there was good fishing, — mostly bass, two-and-one-half-pounders. I had trout fishing for one-pounders near Colebrook, N.H."

Roger Wight wrote, on August 23, from Sebasco Estates, Maine, as follows: "I have been here with my wife for two weeks. Al Higgins also was at Sebasco. Al looks 100 per cent, and his wife is lovely. I am enclosing a paper Al gave me concerning his power company. Having personally made a '2' on the golf hole shown on this card, I hope to be ready for you in 1951 or before!" The paper Roger refers to is "Power Lines," the house organ of the Florida Power Corporation, of which Al is president. The principal features include a report of the formal dedication ceremonies for the George E. Turner plant at Benson Springs, which is referred to as "the huge generating station." Also a report that about 83,000 shares of the recent issue of 100,000 shares of the F.P.C. were sold on rights issued to stockholders. This is characterized by a financial expert as an unusually large proportion. There is also a resolution by the board of governors of the St. Petersburg chamber of commerce on the occasion of the 50th anniversary of the Florida Power Corporation praising the foresight of the men who founded the company and its long record of progress in the electric industry, and paying tribute to the organization and the employees as community builders.

I report with regret the deaths of two classmates: John P. Briggs on July 12 at Plymouth, Mass., and Louis E. Williams on August 21 at Detroit, Mich.

The following obituary is from the *Old Colony Memorial*, Plymouth, Mass.: "The Rev. John Porter Briggs, of Shenandoah, Pa., a native of Plymouth and a rector of the All Saints Episcopal Church in Shenandoah since 1910, died here . . . at the home of his sister, Mrs. Sumner Allan Chapman of 15 Bayview Avenue. Rev. Briggs, who was 67 years of age, had suffered ill health for the past several months and had come to Plymouth for convalescent purposes, making his stay at his sister's home. He was born in Plymouth, a son of John B. and Annette (Cornish) Briggs, both of Plymouth, and was educated in the Plymouth public schools. Studying an engineering course at M.I.T. in Boston, Mr. Briggs had graduated from that institution

in 1901. He then turned to theology and was a graduate of the General Theological Seminary in New York City. Under his learning as a civil engineer at M.I.T., Mr. Briggs had been employed with the American Bridge Company in Philadelphia, the Bethlehem Steel plant in Steelton, Pa., and the Eastern Steel Mills in Pottsville, Pa. He was a thirty-second degree Mason and was a past master of Shenandoah Lodge, A.F. & A.M. Mr. Briggs had been commander of the Ivanhoe Commandery, No. 31 Knights of Templar; a former High Priest Mizpah Chapel No. 252 R.A.M., Mahanoy City, Pa.; past master of Shenandoah Lodge, A.F & A.M., and had been affiliated with the Consistory, Williamsport, Pa., and a member of Moriah Council at Bluesberg, Pa. He had been very active in the work of the Red Cross chapter in Shenandoah, having helped to organize the chapter and served with it for the past 20 years. During the war years, when teacher help was short, Mr. Briggs had joined the faculty of the West Mahanoy Township High School. He is survived by his sister, Mrs. Sumner Allan Chapman, two nephews, Sumner A. Chapman Jr., and John C. Chapman, and one niece, Miss Annette J. Chapman, all of Plymouth. . . ."

The following obituary clipped from a Detroit paper, was sent in by John T. Cronin '17, Secretary of the Detroit M.I.T. Association: "Louis E. Williams, 67, prominent in Michigan engineering circles, died [on August 21] in New Grace Hospital after a short illness. He lived at 3256 Carter [Avenue, Detroit]. Mr. Williams was manager of the Engineering Societies Personnel Service. For many years he was active in the Engineering Society of Detroit and the Michigan Engineering Society. Born in L'Anse, Mich., Mr. Williams received a Bachelor's degree in mechanical engineering at . . . Technology in 1902. Most of his career was spent in marine engineering and construction work in the Great Lakes area. He served as manager of the Personnel Service since 1940. Mr. Williams was a past president of the old Detroit Engineering Society, and past president of the Michigan Engineering Society. Surviving are two daughters, Mrs. E. B. Harrison, of Alliance, Ohio; Mrs. C. J. Jakust, of Detroit, and three grandsons, Keith, Berry and Gordon Harrison, of Alliance." — Guy C. Peterson, *Secretary*, 788 Riverside Drive, New York 32, N.Y. Theodore H. Taft, *Assistant Secretary*, Room 3-266, M.I.T., Cambridge 39, Mass.

1905

After the copious notes for last month's issue, this one will seem rather meager, but it might suggest to those who read so interestedly last month of Perkins, Bob Gardner, Dan Harrington, Barron, Elliott, and others that it would be as interesting to read in the January issue a story of your doings. Please help the Secretary earn his redoubled salary.

In the last issue you read that H. Lewis Hardy had added a Rev. before his name. I didn't know the story nor realize the significance, until I received a clipping from the Boston *Post* of May 11 which reads like a fairy story! "With 65-year-old H. Lewis Hardy, civil engineer for the Boston and Albany district of the New York Central Railroad System for the past 41 years, the opportunity of entering into the ministry means the fulfillment of an ambition he has harbored for nearly a quarter of a century. Though he was always active in church affairs ever since he can remember Mr. Hardy could never see his way clear to devote his life to it. But now, upon reaching the age of retirement he will carve an entirely new career for himself, one which was always close to his heart, with the vigor of a young preacher starting out from scratch. Back in 1924, while a resident of Auburndale, he inaugurated the junior church, worship and preaching service, at the Centenary Sunday School. It was his opinion that the youngsters were not getting enough out of Sunday school so he appealed to Dr. Earl E. Harper, who was minister of the Methodist Church at the time, for a chance to try out his idea. Instead of just plain Bible reading, he preached 20-minute sermonettes explaining the Bible stories. Several years later when he was transferred to Springfield, he inaugurated the same method of Sunday school teaching at the Wesley Church, and as far as he knows it is still continuing, not only in those two churches but in many others which have adopted it. Through the dozen or more years he conducted his junior church worship services he found that youngsters were drawn closer to church and became more acquainted with the meaning and necessity of religion than he was as a child.

"The winning of a correspondence school scholarship when he was a youngster was responsible for his choosing the career of a civil engineer. Had he not won it at that time, it is quite likely that he would have found himself later and studied for the ministry. He was a newsboy in his native city of Manchester, N.H., at the time, in the days when delivery kids arose at 3:30 A.M. to meet the train and get their papers. During the three years he made his deliveries he made numerous friends along the route, and it was these friends who clipped coupons from the papers and voted for him as their choice for the scholarship prize the I.C.S. was offering in a contest. Mr. Hardy doesn't remember how many votes he got, but they were so numerous he thought the entire population of Manchester voted for him. By the time he completed the I.C.S. course he was ready for college, and with the start he had in engineering he decided upon continuing at . . . Technology where, under Professor C. F. Allen, he took the railroad engineering course, a course which was abolished two or three years ago when the noted professor retired. Circumstances caused him to leave M.I.T. after three and one-half years, and instead of graduating with his class of 1905 he went to work for the Boston and Albany R. R. His first job was as a chain man in a surveying gang which meant that he was the man who lugged and stretched out the 100-foot steel tape as well as attending to all the dirty chores that go along with it, like pounding stakes in mud holes, etc. They were doing the preliminary work in connection with the abolishment of grade crossings on the Newton Highlands branch line.

"Since that time there isn't an inch of territory over which the B. and A. tracks run that at one time or another hasn't come under his supervision. To him fell the task of smoothing curves in later years to allow trains to travel at higher speeds. . . . Every track siding built by the B. and A. during the past 40 years was under his guidance. The last and largest of all is the one to care for the needs of the new General Motors plant now under construction in Framingham. His work on the railroad consumed every minute of his time, and it was only during his two weeks' summer vacation that he found time to think out and plan his sermonettes, and emergency sermons if he were called upon to give them. Mr. Hardy acquired his preacher's license in 1943. He would have had it earlier but did not know it was essential. Upon acquisition of the license and knowing that he would soon be ready for retirement, he went in for study for the ministry in a big way, not in college but at home during his spare time. That he is ready for service in the church is evidenced by the call to the Monmouth, Me., parish. He will be ordained sometime this week by Bishop Lewis Hartman."

Retirement seems to be the order of the day for '05. Harold C. Mitchell, under whose supervision as superintendent of the building, grounds, and power division of the Erie Works of the General Electric Company most of the major construction of the plant was carried out, retired from active service on a company pension on September 1. Mitch was 66 years old in April and had been a member of the force at the Erie Works for 37 years. He had joined G. E. in Erie on July 27, 1910, when there were only 12 employees on the grounds, all resident engineers. He witnessed the growth of the plant to the present approximately 17,000 men and women.

On January 1, 1918, Mitchell became superintendent of the East Erie Commercial Railroad and on March 1, 1920, was appointed superintendent of power of the G.E. works. One month later he was appointed superintendent of building and grounds. Two years later he was named to the superintendency of maintenance and power, responsible for general maintenance throughout the plant, and also of rail transportation and the police and fire sections. The division he headed was expanded in October, 1925, to include the building and grounds engineering divisions, and on December 24, 1928, the maintenance and power divisions and building and grounds engineering division were combined as the building, grounds, and power division. As of the same date, he was appointed superintendent of the combined division. The rest of the story as to Mitch's plans is not known here at present. Perhaps he'll have time to reune with us again next June.

Carl Graesser was in Boston for several weeks during the late summer and early fall for an eye operation, which Carl said was not serious, but terribly confining. He kept in touch with my office by telephone but did not invite the gang up, apparently remembering one night at the Copley Plaza about ten years ago. Since his return to Westport, he has reported the operation entirely successful. — Fred W. Goldthwait, *Secretary*, 274 Franklin Street, Boston 10, Mass. Sidney T. Strickland, *Assistant Secretary*, 69 Newbury Street, Boston 16, Mass.

1907

Percy J. Colvin, IV, whose home address is 24 Fruit Street, Worcester, Mass., is with Coghlin's, Inc., 244 Main Street, Worcester, electrical contractors. — Everett R. Cowen, living at 1420 Goddard Avenue, Louisville, Ky., is an engineer with the Struck Construction Company, 147 North Clay Street in the same city. — George Crane of Temple and Crane, engineers, Chamber of Commerce Building, Boston, reported in October that his fourth grandson had just arrived in the world. — According to an article in the Newark *Evening News* of August 5, Allan Cullimore, President of the Newark College of Engineering, began a year's leave of absence on last November 1. During the past year Allan oversaw the completion of plans for a $2,700,000 building program at the college, and he will continue during his year off to be available as a consultant in connection with the development of new structures which were begun last August.

Carroll S. Dean, VI, according to the 1947 Washington, D.C., telephone directory, lives at 3722 Warren Street, Northwest, in Washington. I am not sure about his business connections. — Cornelius S. Fleming, X, lives at 5127 West Boulevard, Los Angeles, Calif. — James M. Gaylord, who is chief electrical engineer for the Metropolitan Water District of southern California, with office at 306 West 3d Street, Los Angeles, lives at 1152 Adair Street, San Marino 9, Calif. — Frank E. Hamilton, VI, lives at the University Club, 924 East Wells Street, Milwaukee, Wis., according to the directory of that city. Warren I. Keeler, V, is treasurer of Keeler's Paint Works, Inc., at 58 Golden Street, New London, Conn., and lives at 76 South Ledyard Street, in that city.

Vice-admiral Emory S. Land, associated with our Class as a naval constructor, receiving his master of science degree in 1907, is now president of the Air Transport Association of America, Inc. He was chairman of the United States Maritime Commission from 1938 and during the war years directed a program for the building of 5,600 ships. He was named war shipping administrator in 1942 and was responsible for the operation of the entire merchant fleet. — Edward G. Lee, designing engineer for the New England Power Service Company in Boston, lives at 62 Myrtle Street, Apartment 3, Boston. — Byron P. Luce has a home address at Oak Bluffs, Mass. He is an expert in the organization and management of sugar plantations, but I do not know his present business connection. — John Mather, retired from the United States Army as a brigadier general, has for address P. O. Box 184, Cotuit, Mass. — Emerson Packard, now living at 19 Chestnut Street, Malden, Mass., is a sales engineer with the J. C. Corrigan Company, Inc., conveyor and coal handling machinery of Norwood Street, Dorchester (a part of Boston), Mass. — DeWitt C. Ruff, II, living at 2211 St. Clair Street, St. Paul, Minn., is treasurer of the Healy Ruff Company, heating specialty manufacturers at 2255 University Avenue, St. Paul. — L. P. Russell, VI, living at 1 Garet Place, Yonkers, N.Y., is a real estate operator in New York City, as far as I know. Oscar H. Starkweather, still in business doing general contracting work, now has a home address at 1090 Greendale Avenue, Needham 92, Mass. — Joseph D. Whittemore is a vice-president of the Chase National Bank in New York City at their 18 Pine Street branch. — Edward H. Wing, associated with us in Course II and XIII, is president of the Charles F. Wing Company, a large department store in New Bedford, Mass. He is also a director in the New Bedford Five Cents Savings Bank and in the Merchants National Bank of that city. He has two sons, Allan Barrows and Edward H., Jr. His home is at 2 Wilson Street, South Dartmouth, Mass. — John S. Nicholl, II, is retired from active business, not in too good health, living at 15 Leighton Road, Wellesley 81, Mass. — Bryant Nichols, *Secretary*, 23 Leland Road, Whitinsville, Mass. Harold S. Wonson, *Assistant Secretary*, Commonwealth Shoe and Leather Company, Whitman, Mass.

1909

On two consecutive days in September the Review Secretary had opportunities to meet a classmate who was passing through Boston. In the notes we have already stated that John Mills, VI, had retired from personnel work with the Bell Telephone Laboratories and had gone to Cal. Tech at Pasadena to continue the same type of work. He now tests the aptitudes and other characteristics of applicants for admission, the object being to select only those who seem to be adapted to the tough scientific curriculum at the school. Late in September the Review Secretary was invited by Dean Bender of Harvard College to a dinner at the Faculty Club, held on September 23, to meet John. At the dinner there were several other deans, heads of science departments, and professors who had also been invited to hear John describe his methods of test and selection as well as his personal experiences. It seems that during the war when the Underwater Sound Laboratory at Harvard was recruiting scientists for its secret, highly specialized research work, it was necessary to screen the applicants very carefully, as the work required a high degree of scientific ability and resourcefulness. It now appears they sent to New York for John to assist them in this problem, and he surely did make good. This was the reason that he was invited here on this occasion. His talk was most interesting, and some of the principles which he described may be found in his paper, "Aptitudes and Engineering Careers," appearing in the July number of *Mining and Metallurgy*. John was planning to leave the next day for Pasadena to continue his work there. We all wish him a happy winter in the sunshine of California.

The next evening a call was received from Charlie Johnson, IV. He was in Boston en route from his old home in Putnam Valley, N.Y., to the University of Maine's Brunswick campus, where he teaches mechanical drawing. We asked him to come out to Mount Vernon Street to spend the night, and Muriel and I enjoyed his visit very much. We learned that he had been leading a rather strenuous life during the summer, trying to do too many things at once, and it had begun to tell on him. As a precautionary measure, the doctor ordered him to spend ten days or so in the Peekskill, N.Y., hospital just to insure his obtaining needed rest, and he has been ordered to take it easy now and henceforth.

In the New York *Times* of October 17 appeared a news item describing the first annual dinner meeting of the Twenty-five Year Club of Ford, Bacon and Davis, Inc., engineers, held at the Hotel Biltmore. In addition to two of the three founders of the company in 1894, George W. Bacon and George H. Davis, there was Harry E. Whitaker, VI, one of the three vice-presidents.

We already have told of Brad Dewey, X, having been elected a member of the school committee of Cambridge and how he immediately began to devote his abilities to the improvement of public school education in the University City. Brad has been able to effect many advances and improvements, although it has been an uphill fight with the politicos. In the October 11th number of the *Harvard Alumni Bulletin* there is a four-page article by Brad and Richard Morris, Harvard '44 (with their pictures), entitled "What's Wrong with Our Schools." The article points out that more and more families, of moderate means even, are sending their children to parochial and private schools not only because the quality of education at these schools is superior, but because the child is treated as an individual and the child's curriculum is selected to fit his particular aptitudes. The article states that failure to provide education of superior quality in the public schools is a serious threat to our democracy. Among the projects that are being put into operation to meet the situation, the Cambridge schools are installing a guidance program to assist students in the selection of curricula best adapted to meet their needs.

In the same number there is the announcement of the birth of a daughter to Mr. and Mrs. Gustavus J. Esselen, 3d, of Marblehead, Mass. The happy grandparents are Gustavus J. Esselen, Harvard '09, and Henrietta Locke Esselen, V, of our Class.

We must report the death of another classmate beloved by all of us, William H. Jones, II, who passed away on October 17 at his home at 181 Maplewood Street, Watertown, Mass., after a long illness. Bill was born in Cochituate, Mass., in 1886 and prepared at the Ashland, Mass., high school. He became a member of the faculty at M.I.T. in 1911 and at the time of his death was an associate professor of mechanical engineering. All of us who have been at all associated with the teaching staff at the Institute know of his devotion to his teaching and the deep interest which he took in the personal welfare of his students. He was prominent and active in the work of the Tremont Temple Baptist Church in Boston, where the funeral was held on Sunday, October 19. He was chairman of the missionary committee, for a number of years had been deacon, and for 18 years was leader of the Boys Club. For some time Bill had not been well, and during the last six weeks the bronchial asthma with which he was afflicted affected his heart. He leaves his wife, Grace Travers Jones, and two daughters, Mrs. James P. Ledbetter, Jr., of Watertown, Mass., and Mrs. Edward F. Caldwell of Stratford, Conn., his father, and four grandchildren. We have conveyed to Grace personally the sympathy of the Class, and a suitable floral

tribute was sent. Grace reported that the number of flowers was "overwhelming" and also that President Compton had come to her home to convey not only his personal sympathy but also the high esteem in which he held Bill. The death of Clark Robinson, X, last May and now of Bill removes, within a few months, the only two members of '09 who were on the Institute Faculty. — PAUL M. WISWALL, *Secretary*, 90 Hillside Avenue, Glen Ridge, N.J. CHESTER L. DAWES, *Review Secretary*, Pierce Hall, Harvard University, Cambridge 38, Mass. *Assistant Secretaries:* MAURICE R. SCHARFF, 285 Madison Avenue, New York 17, N.Y.; GEORGE E. WALLIS, 1606 Hinman Avenue, Evanston, Ill.

1910

Returning to the office after a vacation of three weeks in Nova Scotia, I find news of the death of four classmates. Of Charles J. Toner, who passed away on July 6, 1946, I have no further information beyond the notice. Guy W. Bolte died on September 21 in New York City. At the time of his death he was connected with the United Newspaper Magazine Corporation.

Harrison W. Flickinger passed away on October 5 in Garden City, Long Island, N.Y. The following is from the New York *Herald Tribune* of October 6: "He was born in Erie, Pa., and was graduated from . . . Technology in 1910. He obtained a degree in aeronautical engineering in 1918. In World War I, he was commissioned a first lieutenant in the aviation section of the Signal Corps. He retained his military commission at the end of the war, and advanced to the rank of lieutenant colonel, which he held until his retirement in 1939. During his military career, he did test work on the first superchargers ever developed for aircraft, and in 1924 installed the first turbos ever used in American planes in 13 Army Curtiss P-6's. Colonel Flickinger joined Republic Aviation Corporation after his retirement from the Army and was assigned to the export division. He left for Europe within two days and obtained the company's first export contract, which was for 100 P-35 pursuit planes for the Swedish government. He was elected vice-president of the company in 1941 and the next year went to England with the first P-47 Thunderbolts and remained as European representative. His liaison missions took him to Africa, Tunisia, Italy and France, and he made eight trans-Atlantic flights between the Republic plant and the European theater. He also witnessed D-Day from a B-24 assigned to observation duty. After the invasion, he planned to go to the Pacific for further liaison duty, but became ill and had to remain at the home office for the rest of the war. Colonel Flickinger was knighted in the Order of Vasa by the King of Sweden for his service in the development of the Swedish Air Force and was commended by both General of the Army H. H. Arnold and General Carl A. Spaatz for his work in the European theater."

Alfred I. Phillips, Jr., passed away on October 6 in South Orange, N.J. Phillips was very active in Technology and class affairs, being a member of the M.I.T. Club of Northern New Jersey, recent class agent on the Alumni Fund, and an honorary secretary of the Institute. The following is from the Newark *Evening News* of October 8: "Mr. Phillips, a consulting engineer of New York, died . . . at St. Vincent's Hospital, New York, after a brief illness. He was 60. Born in Philadelphia, Mr. Phillips was a graduate of Technology, where he was a member of Phi Kappa Sigma. He had been a consulting engineer in New York since 1923 and was considered an expert in the various phases of the gas industry. He was editorial director of the American Gas Journal many years and was interested in the scholarship activities of the Massachusetts school. He leaves his wife, Mrs. Josephine Neall Phillips; a son, Daniel Neall Phillips, M.I.T. '38, of Skaneateles, N.Y., and two grandchildren."

It has been a long time since we have heard from Bob Breyer. The following is from the Boston *Post* of October 15: "Glorious Indian summer sunshine added its share of beauty to the simple but attractive wedding of Miss Katherine Ames Byrd, daughter of Rear Admiral Richard Evelyn Byrd and Mrs. Byrd of Brimmer St., who exchanged marriage vows with Robert Garnett Breyer, son of Mr. and Mrs. Robert S. Breyer of Houston, Tex. Large urns of white chrysanthemums decorated the Empire dining room of the Byrd home for the 4:30 o'clock ceremony performed by the Rev. Robert G. Metters of Emmanuel Church before a tiny altar erected across the bay window of the room." — HERBERT S. CLEVERDON, *Secretary*, 120 Tremont Street, Boston 8, Mass.

1911

Bill Martin, VI, a fellow of the American Institute of Electrical Engineers and director of apparatus development of the Bell Telephone Laboratories, must have his misgivings as to New England hospitality since his hectic appearance as a witness for the New England Telephone and Telegraph Company in a rate hearing at the State House in Providence, R.I., late last summer. Bill was called to the stand by the telephone company's chief counsel to describe the physical plant of the Bell Laboratories and its contribution to operating telephone companies in the vast Bell system. He was frequently interrupted by the state's counsel, who complained to the public utility administrator conducting the hearing that Bill's prepared statement was too lengthy and largely irrelevant. Another heated clash developed soon after a lunch recess, when Bill gave specific examples of the advantages accruing from the research work of the laboratories in developing new apparatus, such as the new telephone hand set first made available to subscribers in 1937. P.S. A rate increase was granted.

Liv Ferris, VI, also with the Bell Telephone Laboratories, is this year's meetings chairman for the M.I.T. Club of Northern New Jersey and already has an acceptance from General George Kenney, I, to be the club's guest on December 4. The meeting is to be held at the Hotel Essex House in Newark at 6:30 P.M. Liv is planning a roundup of 1911 for the affair. Your Secretary means to attend if possible and hopes to see many classmates from the metropolitan area and New Jersey present.

Charlie MacManus, I, and his wife, Elinor, now have a new home at 25 Ocean Street, Beverly, Mass., where they say the latchstring is always out for members of the Class. Meanwhile Ed and Marie (Herlihy) Ledden are making their first home at 21 Silverside Road, Wilmington, Del., and very happy about it. In mid-October, after several weeks at home with his family in Vineland, N.J., Frank Osborn, III, has returned to South America, his address becoming Andes Copper Mining Company, Potrerillos, Chile.

In retrospect, Don Stevens, II, has composed another story called "Adventure Going for the Cows" and describing a wild experience with a runaway Ford while at his son's farm a year ago this spring. The old Ford stalled and was stuck, trying to back down onto the road from a banking, with the exhaust pipe buried in the earth. Don jacked up the car and put stones under the rear wheels while his wife, Lois, went back to the farm for help. Don finally was able to tie up the exhaust, found that the motor would run, and then, noting that Lois had left the brake on, he let the car down off the jack and began to remove stones. Don, however, didn't know what the family knew — that the brake didn't hold very well, so that it was wise always to leave the car in gear.

You guessed it — as Don removed the last stone, the empty Ford started backing, went clear across the road, and rolled on down the steeply sloping hayfield, with Don running alongside desperately holding onto the door handle, trying to stop the car. It just missed some stone pillars belonging to a former farm and finally, about two-thirds of the way down the hill, began to describe an arc, and eventually swung around parallel to the creek for which it was headed. Don got in and drove up the hill to the main road, where he met the rescue party. He was none the worse except for some chagrin at his ineptness.

We fulfilled our Alumni Fund quota of 121 subscribers in early October, just as we did a year ago, and 83 per cent of our $2,800 quota, as opposed to 81 per cent a year ago. Keep those subscriptions coming! — Once again it is the sincere hope of Dennie and Jack that all 1911 men and their families will have a very merry Christmas and a happy and prosperous New Year! — ORVILLE B. DENISON, *Secretary*, Chamber of Commerce, Gardner, Mass. JOHN A. HERLIHY, *Assistant Secretary*, 588 Riverside Avenue, Medford 55, Mass.

1912

We are off to a good start on our new policy of more and better class notes for 1912. The reunion generated some news. Fred Barker, X, writes: "Since our grand and glorious reunion, which, by the way, my wife and I enjoyed to the utmost, I have been pounding the pavements looking for good mortgages, which is the prime job of every savings bank fellow today. I found time, however, to go to Henderson Harbor for a day's bass fishing with a group of friends. I shall be busy for the next two months on the Community Chest campaign, wherein I have the questionable privilege of heading the advanced gifts committee. I took care at the reunion, however, to get some coaching from Milton Kahn, who is vice-chairman of the Boston Community Fund." Fred is president of the Syracuse Savings Bank.

Andrew F. Allen, VII and XI, chief of the Bureau of Camp Sanitation, in the New York department of health, writes from Albany: "On June 5, I received a master's degree in public health from Harvard University. Some 30 years ago, I attended the School of Public Health then operated jointly by M.I.T. and Harvard. That school gave only a certificate in public health. After several years it was taken over by Harvard, and since then master's and doctor's degrees have been given. The Harvard faculty decided that the former students of the jointly operated school were entitled to a degree of recognized rating and accordingly granted the degree of master of public health to 30 or more students. Many of the men and women who were present for the ceremony had already retired from active work. There were several deans of schools in the group, which was a colorful one. I know that the recipients very much appreciated the recognition given them by the University."

Professor Jerome C. Hunsaker, XIII-A, has been relieved as head of Mechanical Engineering to devote his full time to the Department of Aeronautical Engineering. This department greatly expanded its facilities during the war and will now stabilize on an enrollment quota double its pre-war average. Jerry writes: "I expected that I should acquire some leisure for a long summer holiday, but instead I am spending most of my time in Washington as a member of a special board appointed by President Truman to study recent airline accidents with a view to recommending action to enhance the safety of air travel."

Milton Kahn, X, writes from Boston that it is about time that our Class had something in The Review and says, "Nothing startling has happened to me except that a few weeks ago I was elected president of the Associated Jewish Philanthropies of Greater Boston. Thus, I shall have charge of administering two hospitals, one college, one free loan association, four children's camps, several hundred children, quite a number of destitute families, two settlement houses, and other things too numerous to mention. This will take up quite a bit of time for the next three years. I also had my first grandson, who should be M.I.T. 1968. To think that I should live so long!"

From Toronto, Canada, Bernard Morash, VI, states that he is delighted with the new set-up for gathering material for the class notes and that: "I think most of our classmates must have looked eagerly in each issue of The Review to find some notes, and now they will have their wish gratified. The 35th reunion at East Bay Lodge was a standout, even though the weather was against us. Those who did not attend cannot appreciate what they missed. My wife and daughter enjoyed every minute there, and the general atmosphere at all times indicated that everybody else did likewise. We will not fail to attend the 40th reunion unless Providence intervenes. After the reunion, I spent a few days at our head office and plant in Cambridge, which is directly behind the Institute, and then we drove to New York. We had never been over the Merritt Parkway, and that was something right out of heaven. We had two delightful days with friends in Garden City, seeing many of the sights in and about New York that we had failed to see when we lived there from 1924 to 1926. We drove to Philadelphia, where we spent some days with a brother of mine, and then we toured through the mountains to Toronto. We never enjoyed a trip more than this one. I am sure that you are going to get bits of news from classmates all over the world which will be of great interest to all of us."

Harold C. Mabbott, until recently an Army colonel, writes from Fort Adams, R.I., in answer to a request for news: "You asked me to write you for the next Review. That was back in May, when I was putting in about 15 hours a day getting rid of the small post that I was commanding. I didn't come up for air until July 1, when the place was completely evacuated by the Army. Since then I have been awaiting retirement orders and simultaneously looking for a place to live. After a five-state search, we finally settled on Swarthmore, Pa., and hope to be at home to our friends about November 15, if the deal goes through. Our specifications for a place to live had to be somewhat revised, as a result of current conditions, but we think we shall like it. So far we are not in the decrepit condition to feel that we must move further south, although that may come. My retirement, fortunately, is not due to stiffened joints but is voluntary — a desire to settle down after 30 years of service. I got back from Europe in December, 1945, and after a trip to Fort Bliss, Texas, for reassignment, was ordered to Fort Rodman, in New Bedford. Because of obsolescence, this post was declared surplus, and I should have had to be reassigned, so decided to avail myself of retirement rather than move again. It was a great pleasure to see you and those who were able to turn out for the reunion. Although Mrs. Mabbott and I have not been able to take in many, we feel that it was the best we have been to. We saw Malcolm Priest and his wife on their vacation this summer, when they visited us at Fort Adams, R.I., where I am now located. Mac is in excellent health and enjoying his work with United States Steel in Pittsburgh. He regretted not being able to attend the reunion. For the benefit of those that do not know, Swarthmore is only a few miles from Philadelphia and near Route One. The address will be, we hope, 417 Harvard Avenue, only a few minutes from the railroad station and shopping center. We want any or all of our friends, finding themselves in that vicinity, to look us up."

The letters quoted above set splendid examples to the rest of the Class to go and do likewise. Promises have been received from a number of the men, and we look forward to the delivery of their letters soon. Page Golsan, VI, has distributed a printed directory of class members now living, which is sure to be greatly appreciated by all. He is now settled in Los Angeles and regretted his inability to come to the reunion. Ralph Symonds, II, was under the weather and unable to attend, but the list of those present brought back memories. Les White took numerous pictures at the class dinner, and about half the men present ordered sets. Several of the recipients reported back that the likenesses were excellent of everyone but themselves. Draw your own conclusions.

And now a word to the wives. The discussions at East Bay Lodge showed how eagerly the ladies look for news of 1912 and how disappointed they sometimes are. One of the wives, who prefers that her name be withheld, has sent in a poem bearing the message that if the men do not write in the news, the wives should furnish it, even if it results in some Bronx cheers. Information from either side of the house will be accepted with thanks. — FREDERICK J. SHEPARD, JR., *Secretary*, 125 Walnut Street, Watertown 72, Mass. LESTER M. WHITE, *Assistant Secretary*, 4520 Lewiston Road, Niagara Falls, N. Y.

1913

Arrangements for our 35th reunion in June, 1948, are in the capable hands of our Class President, Bill Ready. Hard worker that he is, it means that we have something pleasant to look forward to. Now is the time that you should begin to make your plans to be in on the party. We hope to have dates and details in your hands early next year.

On Alumni Day last June, Bill Brewster made arrangements at the Algonquin Club for cocktails before the dinner at the Statler. The Brewsters, Achards, Ed Cameron, Effie MacDonald Norton, Lester Gustin, Nat Sage, Bill Ready, and Fred Murdock were there. As last year, the party was delightful. The setting, drinks, and company were something to remember.

Lester Gustin, I, is still in his business of steel construction specialties and is happy even though his raw material is very hard to get. He was fortunate to be able to finish building 18 apartments in Winchester, in 1942, and to enjoy the advantage of a foresighted landlord. Lester had two sons in the war, one of whom was with Patton in the European push, as a lieutenant colonel. Since he had entered the service as a private, Lester is justly proud of this record.

The Johns-Manville Corporation has very astute management, as you will observe on reading the following information release, dated June 25: "Establishment of a new executive office in the Johns-Manville Corporation 'in recognition of the high importance of the relationships between the company as an enterprise and the men and women who comprise the enterprise,' was announced today by R. W. Lea, President. L. C. Hart, general sales manager of the company's building products division, has been elevated to the new office and appointed vice-president for relationships by the board of directors. 'In this new position Mr. Hart will have the responsibility for assisting the President in carrying out the basic policies established by Lewis H. Brown, chairman of the board, to promote a sympathetic understanding between the company and its members,' Mr. Lea said. The appointment of a vice-president for relationships places this phase of Johns-Manville operations on a level with production, sales, finance and research, he pointed out.

"Mr. Hart, who has served the company for more than 30 years in positions of responsibility, was born on May 8, 1891, at Dayton, Ohio, and was graduated from Technology in 1913 with a bachelor of science degree. In 1914, he joined Johns-Manville at New York as an engineer. He has held numerous sales positions with

the company, including that of sales manager for the western division with headquarters at Chicago, and district manager for the metropolitan New York area. A specialist in sales problems and management, as well as human relationships, Mr. Hart has been active in industrial affairs and is well known in business from coast to coast. He is a director and former president of the Producers Council, national organization of building products manufacturers, and member of the construction industry committee of the National Association of Manufacturers. Recently, he completed an assignment on the construction and civic development committee of the United States Chamber of Commerce. Mr. Hart is a director and member of the executive committee of Junior Achievement, Inc., which encourages young men and women in acquiring business experience by actually forming their own small corporation or companies and manufacturing and selling simple products. He is married and has a son, Fred V. Hart, who is associated with the Plymouth Cordage Company, and a daughter, Mrs. Bernice Virginia Tompkins. Mr. Hart is a member of Sigma Alpha Epsilon and the Engineers Club of New York. Mr. Hart resides with his family at 4 Park Avenue, Bronxville, N.Y."

Anent the Alumni Fund, please note particularly the second paragraph of Dave Nason's letter: "The contumelious prose from one Sam Knight of Arizona as quoted by you in the current issue of The Review has aroused my ire. One might presume from the postulating meanderings of Arizona's own adopted Samuel that the synthetic syrup of Kentucky dew is more prevalent and potable in the arid West than elsewhere. Do not misunderstand me. I would not for a split second disparage or depreciate Sam's vaunted right to fame as a mix-master, as I well remember the time he dissolved the enamel on the bathtub, yet came up with a fluid which would make a donkey fly. So we are going to have our 35th reunion in Boston. I will come. I would not miss it if I had to go to Arizona and drink cactus juice with Sam. Meanwhile, do not overlook the factual and courteous appeal of Larry Hart for donations to the Alumni Fund, not only that our Class may not suffer by comparison with our contemporaries but also that our alma mater may have tangible evidence that we appreciate what she did for us."

Arthur Carpenter, X, is manager of the B. F. Goodrich testing and research laboratories in Akron. A Providence friend, David Scott, who makes a lot of textile- and rubber-testing machines, says that Arthur has a big job and does it very well, besides doing a lot for his industry. I make this explanation because Arthur's letter, which follows in part, doesn't tell the whole story: "As you perhaps know, I have served as president of the American Society for Testing Materials from June of 1946 until the annual meeting at Atlantic City last month. This job, in addition to my regular duties at the B. F. Goodrich Company, has complicated matters, especially as my A.S.T.M. term turned out to be very active. The society purchased a new headquarters building in Philadelphia something over a year ago. Last summer, it was remodeled and refurnished, and we moved in. This work was of course surrounded with difficulties incident to all construction during the time but it was finally completed, and in February, about the time your note was received, I was in Philadelphia officiating at the dedication ceremonies.

"We are really wonderfully located now in a permanent home on Logan Square, facing the parkway quite near the Franklin Institute and the Philadelphia Library. In March, I went to the West Coast to meet with our members in San Francisco and Los Angeles. These were the last of a series of district meetings with our members in various parts of the country. Incidentally, these meetings are very enjoyable, and they gave me the opportunity of renewing many Technology friendships with members both of our Class and of others. They, too, require much time, however, not only for the traveling but for preparation of the talks and speeches which are inevitable. The grand finale of my term of office was the 50th annual meeting of the society at Atlantic City in June, at which some 1,800 members and guests were registered. This, of course, also involved lots of work, not omitting preparation of the annual address of the president, which should be his swan song but isn't, as he still serves for three years on the board of directors; during one he is on the executive committee and during another is chairman of the finance committee. So you see, being president of this particular technical organization of more than 6,000 members isn't merely an honorary job, and perhaps you can pardon my failures to respond exactly when I should have done so. I feel now like a little boy out of school and can pick up some of the things I had to drop for a time. I shall look forward to the 35th reunion, and if it is anything like the 25th, it will be a great success whether held in Boston, on the Cape, or elsewhere."

Gene Macdonald, I, who is one of the few from the large number of men in the Civil Engineering Course to practice his profession continuously through the years, is now a general partner in the New York engineering firm of Parsons, Brinckerhoff, Hogan and Macdonald. Gene, in the course of his business travels, runs across Henry Thierfelder, I. Henry is high up in the Rhode Island public works department. Gene has moved from Princeton, N.J., to Federal City Road, Pennington, N.J. Arthur E. Howlett, X, is a lieutenant colonel and lives in New York City. Henry Hoornbeek, II, has left Virginia to live at Villa Capricia, Quartier Vaumare, Mougins, Alpes Maritimes, France.

George A. Curtin, IV, died in Boston on October 4. Frank H. Mahoney, V, died on July 19, at the Baker Memorial Hospital in Milton, Mass., after an illness of three months. Jumbo was one of our youngest members, being only sixteen when he entered the Institute in 1909. We shall miss him. — FREDERICK D. MURDOCK, *Secretary*, Murdock Webbing Company, Box 788, Pawtucket, R.I.

1914

This Thanksgiving-Christmas season, is an appropriate time to call attention to the fact that we have a real cranberry king as a member of our Class. A recent issue of *Cranberries*, the national cranberry magazine, has a picture of Russell A. Trufant on the cover and a four-page article about his activities on the inside. In the cover photograph, Trufant is shown at a drafting table with a slide rule and the usual drafting instruments. As would be expected, his inevitable pipe is much in evidence. The picture is entitled "Cranberry Grower with Veneer of Engineering."

According to the article, Trufant is really one of the outstanding cranberry growers in the New England area. His father, also an M.I.T. graduate, was one of the prominent cranberry growers on Cape Cod before him. Russell, however, spent a considerable number of years in civil engineering practice before actually engaging in the cranberry business himself. Apparently, he has applied much of his civil engineering experience to the growing of cranberries. He is credited with unique irrigation designs and is frequently called on to design irrigation ditches and bogs outside his own cranberry farm. He has developed a special type of flume for flooding the bogs, a unique method of re-sanding the bogs, and a special flooding nozzle. He is reported to be one of the few cranberry growers to use mechanical pickers and is the inventor of the "estimating hoop," the description of which sounds very complicated to your Secretary. The trick seems to be to count the number of cranberries required to fill a standard cup; the hoop is then adjusted so that its area bears the same ratio to an acre as the size of the average cranberry in the counted cup bears to a barrel. The magazine article states that it is only necessary to toss this trick hoop around the bog a bit and presto (if not completely bogged down) you know just how many barrels of cranberries have to be picked! Trufant is a director of the New England Cranberry Sales Company and is very active in several of the cranberry growing associations. He is married and has two daughters, one of whom is with the State Department currently on duty in South America.

The August issue of *Chemical and Engineering News* carried several pictures of General Waitt taken in London, where he was the American representative to the 100th anniversary celebration of the Chemical Society of London. Alden was accompanied by Mrs. Waitt, and they had an opportunity to travel over much of the continent as well as England, including a visit to their son who is a lieutenant in the Army, stationed at Heidelberg. The visit of the Waitts was, however, a bit too early to greet their new granddaughter, who arrived at the end of September. Among the new honors that have been awarded to Alden is the degree of Commander, Most Excellent Order of the British Empire.

Another '14 man to welcome a granddaughter at the end of September is Howard Morrison. Boggs, who was formerly with Lever Brothers, is now associated with Arthur D. Little, Inc., also located in Cambridge but a short distance from Boggs's former office. — Right up at the top of the September 27th National Association of Manufacturers *News* was a picture of Norman MacLeod, followed by an article on why he would be attending the N.A.M. meetings in New York early in December. Norm has been very active in that organization and has served as a state director.

Thorn Dickinson, who has been out on the West Coast for a number of years with

the Stone and Webster organization, concerned with projects in the Los Angeles area, has now moved up to San Francisco as resident engineer on the construction of a 200,000-kilowatt steam power plant for the Pacific Gas and Electric Company. — Don des Granges continues to attract attention because of his unique treatment of architectural subjects. The September issue of *American Home* has a most interesting article about Don's own home at Norwell, Mass. A few years ago, Don acquired an old house there and has rebuilt it so that it is apparently a most unique home. In spite of his being an ardent farmer, Don still maintains an active architectural practice in Boston.

As a new year will have arrived before another issue of The Review appears, your Secretary and Assistant Secretary take this occasion to wish all classmates a very good year to come, and to remind them that in another year we shall be celebrating our 35th graduation anniversary. It is not too early to begin to make plans, and one of the ideas being considered is to try to publish an inexpensive directory of the Class. This will require quite a bit of correspondence and clerical work. As it is hoped this can be done with little or no expense to the Class, so that the only cost will be in the printing and distribution of the directory, it will be greatly appreciated if, when the questionnaire forms are received, all members will return them promptly. — Harold B. Richmond, *Secretary*, General Radio Company, 275 Massachusetts Avenue, Cambridge 39, Mass. Charles P. Fiske, *Assistant Secretary*, 1775 Broadway, New York 19, N.Y.

1915

With this December issue go my friendly wishes to all classmates for a happy holiday season — good cheer at Christmas and success and good health in 1948. If the few givers last year to the Alumni Fund who have not yet given this year would send in their checks now, we could end 1947 with a sizable contribution from 1915. Send that check.

On October 17 at the Harvard Club, Boston, 29 classmates gathered for a dinner and jolly evening. This record-smashing attendance speaks loud for the interest and friendliness 1915 men have for one another. Henry Sheils (a member of the Boston Harvard Club) and Sam Eisenberg planned and promoted the dinner. Henry rounded up a good many of the boys by personal and telephone follow-up calls. Our thanks and cheers to both Henry and Sam. We discussed the Alumni Fund, and the coming 35th reunion in 1950, when we hope that reliable and efficient committee of Max Woythaler and Weare Howlett will come up again with another attractive and enjoyable place on Cape Cod.

The principal business of the evening was the consideration of a capital gift to the Institute at our 50th reunion — only 18 years away. The idea was enthusiastically received and discussed, resulting in the appointment of a committee to handle it: Gene Place, chairman, with Herb Swift, Reggie Foster, Clive Lacy, Sam Eisenberg, and Henry Sheils. Gene will probably want to add to this list, and I urge any of you whom he asks to serve on his committee to give willingly of your time and interest. It strikes me we can really do something big in this way for the Institute.

The gay gathering numbered the following: Bill Brackett, Wayne Bradley, Whit Brown, Sam Eisenberg, Vic Enebuske, Reggie Foster, Louie Gale, Abe Hamburg, Loring Hayward, Weare Howlett, Clive Lacy, Azel Mack, Clyde Mackenzie, Archie Morrison, George Moulton, Pete Munn, Frank Murphy, Johnnie O'Brien, Wallie Pike, Gene Place, George Rooney, Chet Runels, Frank Scully, Henry Sheils, Jac Sindler, Ed Sullivan, Speed Swift, Fred Waters, and Max Woythaler.

This was Vic Enebuske's first class dinner upon his recent return after a long absence out West. Vic is now with E. B. Badger and Sons in Boston. The long-distance prize winners were: Max Woythaler, Framingham, 20 miles; Whit Brown, Concord, 20 miles; Fred Waters, Marblehead, 20 miles; Chet Runels and Reggie Foster, Lowell, 25 miles; Loring Hayward, Taunton, 35 miles; Clyde Mackenzie, Providence, 45 miles; The Honorable Speed Swift, New London, N.H., 100 miles; Wayne Bradley, Bridgeport, Conn., 180 miles. Cheers to these men for their loyalty. In the midst of our dinner, Charlie Norton telephoned from Martha's Vineyard to greet the Class. It was a thoughtful remembrance. Charlie's new business installing heating, cooling, and ventilating systems is going along successfully. All the best to him!

Frank Scully is leaving soon for a business trip to England and the continent and will plan to see Ken Boynton, recently transferred to Paris from Mexico City. At this writing, Jim Tobey and Tower Piza are working on plans for a New York City class dinner, which we hope will develop. It is now hoped to have a class dinner in Boston this winter for wives and daughters of the Class and Sons of 1915 now attending M.I.T. This will probably require the feminine finesse of Barbara and Virginia Thomas, our ever dependable help in time of such need.

Want to have a laugh? See page 125 of the October issue of *American Magazine* and get a look at Bridge Casselman, with his face covered with lather, and his article on "How to Shave." What will these '15 men get into next?

Please remember that these class notes won't be written if I haven't material for them. Every single member of 1915 has a duty to perform; send me at least a few lines about yourselves, your family, and what you are doing. Azel needs help, so keep in mind that you must "help Azel!" — Azel W. Mack, *Secretary*, 40 St. Paul Street, Brookline 46, Mass.

1916

Seasons greetings, merry Xmas, and a very happy New Year, and if you are thinking of spreading good cheer, how about letting your humble scribes know where and how you are? That information would be the best present we could receive.

Jack Stafford from Wearimus Road, Hohokus, N.J., writes as follows: "I should have answered your letter sooner had it not been for your request for news. I have been such a backslider with regard to participation in class activities that it is difficult to begin now where I should have begun 30 years ago. I have always been in the engineering end of the sugar industry, manufacturing equipment and designing sugar factories and refineries. This work has taken me to practically all the tropical, cane-producing countries and to some extent accounts for the backsliding already mentioned." This is an exceedingly modest account of 30 years of outstanding activity in this field.

Phil Baker has promised to lend us a helping hand. From his office at the J. Lee Baker Company, realtors, Penobscot Building, Detroit, he writes, "I shall be very glad to get in touch with some of the boys we know in the city and write a letter for you." This is the kind of helping hand we need for the Class is so large it is difficult to reach everyone, and we like to have a good cross section.

Rusty White is on a cross-country tour, lecturing on his *Combined Gospels*. He sends us a lengthy letter from the Hotel Lafayette in New Orleans describing his trip. He left Boston on May 20, expecting to be home by the 15th of November. He will have visited every principal city in the United States. He and Frances are driving and at this writing have only the Gulf States and the Atlantic Seaboard to go. He mentioned the very favorable publicity he has received, the Chicago *Tribune* giving him a full-page spread in the Graphic Section of September 7. He has also given a Sunday sermon in Henderson, Ky., at the First Presbyterian Church. His book is now through a second printing, and a third is about to come out. He sent a list of the classmates he has met in his travels. In Los Angeles he met Eddie Clarkson and Ken Sully and "had lunch at Fred Harvey's with them. They are both on the engineering staff for the City of Los Angeles.

"In Houston," he continues, "I met Kem Dean and Fanz Staub. One of Kem's daughters is about to be married, and Fanz is the architect for the new library for Rice University. I saw Mark Lemmon in Dallas, Texas. He is the leading architect in Dallas and was the architect for the Cokesbury Press Building, the leading Methodist bookstore in the country. He has been retained by them to double its capacity. In Kansas City, Mo., I met Paul Gardner, and his museum in Kansas City, the Nelson Gallery of Art, is really a knockout. Paul is really '17, but I always think of him as '16. Dina Coleman in Lexington, Ky., is holding down his own contracting business. He informed me that George D. Kittredge has just lost his father, George W. Kittredge '77, former chief engineer for the New York Central and member of the M.I.T. Corporation.

"I had a nice talk with Phil Cristal in Milwaukee, Wis., and in Chicago I ran into Bob Wilson at an M.I.T. alumni meeting at the University Club. In Shreveport, La., I met Ralph Bennett, who is now vice-president in charge of manufacturing for the Union Producing Company. I called, but missed, Brute Crowell in Los Angeles. I have also seen Walter Keith '14, in Akron, Ohio, Doug McLellan '17 in Los Angeles, Howard McClintic, Jr., '19 in Pittsburgh, and Ernie Polley '15 in Denver. Irving McDaniel is retired from the Navy and living in a trailer, while he builds a home on an avocado ranch which he has recently bought. It has been a wonderful trip, and I shall have more to tell you when I get

home." We certainly appreciate Rusty's wonderful letter and envy him the splendid trip.

Speaking of authors, 1916 has several others to boast of: H. W. Green has co-authored *Appendicitis in Cleveland;* Arthur Leighton Guptill published *Norman Rockwell, Illustrator;* and Leicester F. Hamilton '14 and Stephen G. Simpson have prepared new editions of their own *Calculations of Analytical Chemistry*, and *Quantitative Chemical Analysis* by Henry Paul Talbot '85.

Your Secretary met Tom Berrigan at the New England Highway Show in October. He looked very well but said he had had a serious operation last year from which he is now fully recovered.

Our heartiest congratulations to Earl Mellen, who became president of the Weston Electrical Instrument Corporation on May 16. Your Assistant Secretary is glad to report the following from Arthur Caldwell: "I saw Ralph Fletcher in Boston last June, and despite the uncomplimentary things he had to say about us bankers, I am, nevertheless, willing to confide the following information: For nearly 16 years I have been with the Chemical Bank and Trust Company in New York, and during quite a few of them and even now I have managed to hold down the job of vice-president. During all this time the work has been along strictly credit lines, and fortunately it has been of a most varied and interesting nature. My one youngster, a daughter, was graduated from Sweet Briar College last June and is now doing post-graduate work in the drama department at Western Reserve University in Cleveland."

Jim Merritt writes from Montreal that he is on the spot to tell anything about himself which would be of interest to anyone; but he would be surprised how many people are going to be much interested in reading the following message from him: "I came to Canada five days after graduation in 1916 and was with the Shawinigan Water and Power Company for eight years as meter engineer (possibly because Phil Morrison and I did our thesis under Frankie Laws '89), power sales engineer, and divisional transmission line superintendent. I joined the Canadian Ohio Brass Company, Ltd., in 1924 and have been with them ever since; I am now district manager with headquarters in Montreal and am looking after all business east of Ottawa in Canada and Newfoundland. Our chief products are porcelain insulators of all types, transmission line hardware, street railway, trolley coach and railroad electrification overhead materials, rail bonds, and so on, and our main contacts are, therefore, with power companies, transit companies, railroads, mines, and industrial companies operating electrified haulage systems. My work is sales and sales engineering with emphasis on the former; although in these days deliveries, and not sales, are the principal headache. In 1925, I married a Canadian nurse and am still happily married but without issue.

"I still see Bill Wylde, X, about once a year, as I manage to get back to North Adams about that often. G. R. Hale, VI, is here in Montreal with the Shawinigan Water and Power Company, and I run into him rather frequently. He and I joined Shawinigan at practically the same time in 1916. I am sure that all '16 men were as delighted as I was to learn of Earl Mellen's recent promotion to the presidency of the Weston Electrical Instrument Corporation, and I have just read in *Electrical World* of George Ousler's appointment as president of the Pennsylvania Electrical Association. I hear indirectly of George and his activities with Duquesne Light through our Pittsburgh representative.

"In 1944, principally through the activities of some of the younger local graduates, an M.I.T. Club of the Province of Quebec was formed, with headquarters in Montreal. The organization and plans are quite casual, and meetings usually take the form of a luncheon when someone connected with M.I.T. happens to be in Montreal and is willing to give the Club an informal talk on activities at Technology. We have had the honor of a visit from Dr. Compton and several other members of the Faculty. The total membership is probably in the neighborhood of 100, and attendance at the meetings averages possibly 40 to 50. The majority of the members are younger graduates, but the roster includes men graduated all the way from 1891 to 1946. The activities of this Club have kept all Tech men in Montreal in much closer contact than would otherwise have been the case."

One of your secretaries recently had some correspondence with John Gore regarding peanut butter and peanut butter jar tops. Incidentally, John passed along a suggestion for a sandwich spread which he says is excellent, something that he and his family have used for years. Here it is so that you may all try it: Combine peanut butter (Beech-Nut, of course) with marshmallow paste; mix the two together in a bowl, adding a very small amount of water, if necessary, to make a soft paste. (Note: the Assistant Secretary's daughter Dorothy, Wellesley '49, also highly endorses this spread after years of use.)

But sandwich spreads aside, here is the friendly quota of information that John sent to us for inclusion in our notes: "Something happened last week which probably will not happen again and which, according to the theory of probabilities, never should have happened. This is it: I was called to the lobby of our office here at Canajoharie, N.Y., the other day, and who should be there but Dutch Gaus. Well, I put him in touch with our engineer and, while walking over to the engineer's office with him, learned that Harold Gray had also had lunch at the Beech-Nut Hotel here that noon. Now here are three M.I.T. 1916 men in Canajoharie all the same day, all of whose names begin with G and all of whose names have four letters — Gaus — Gray — Gore. This is the first time I have known of any 1916 men but me to be in this town. And when they do show up, to have them all four-letter G's is certainly a coincidence! As regards other members of the Class, while down in New York this spring, I dropped in to see Bill Farthing and had a nice chat with him. His office is in the same building as our New York Beech-Nut office. Also, I learned from him that he was the builder of this particular building, which was news to me and will explain why he is still there.

"Of me there is not much to say. I am not famous, like many of our other classmates, and have no outstanding accomplishments to crow about. However, I have a job that I like, own my own home, have a summer camp whence I commute daily during the summer, have a son 24 years old and a daughter 21 years old. I am in charge of the planning department of the Beech-Nut Packing Company, which means that I co-ordinate sales, production, and purchases. I don't have any title as yet but still live in hopes. As for my hobbies, I am especially interested in nature and outdoor life, particularly birds, wild flowers, etc. Two years ago, during the spring, summer, and fall, we found and identified 250 different species of wild flower. I am also gradually building up a reputation as an after-dinner speaker on birds, along with this giving imitations of birds, animals, and so forth. One more hobby — I am very much interested in the Boy Scouts, and what little fame I have attained may come from this source. I have received the "Silver Beaver" — anybody connected with Scouts will know what that means. I am also district chairman, a member of the executive board, one of the trustees of our council, and representative on the national council from this area."

And now hear what Harvey Stocking has to say about the sport of sailing: "Since I last gave an accounting, my business activities have been transferred to another advertising agency, the Samuel Croot Company of 28 West 44th Street, New York. After putting in some 27 years in the art end of advertising, I now earn my daily bread handling accounts, writing copy, planning campaigns, and the like. I really enjoy it. So much for business. On the pleasure side, having given up golf (got tired trying to get good), I am now trying my hand at boating. It began with the 30-year reunion in '46, when I saw a boat I liked in a Falmouth, Mass., boat yard. (Lou Pratt and George Petit, please note.) I didn't buy that one but a little later bought a 24½-foot cruising sloop on the Cape. I had her fitted out at Falmouth and started to sail her to Darien on the 25th day of May this year. Well, we didn't reach Darien. 'We' means my son John, my nephew Donald White, both 16, and a navigator friend. Fog and a high southeast wind overtook us as we stood out of Buzzards Bay, and after some harrowing escapes from rocky promontories while seeking a harbor, we blundered through the pea-soup fog on to a beach near Newport. No one was hurt, the boat was salvaged, and better still she was fully insured. But it took seven weeks to put her back in shape. If you can call this fun, you now know what I'm doing for pleasure. Anyway, the boys got the thrill of their lives. The boat finally made her home port, Darien, on July 18, all in one piece. Familywise, I'm now a grandpaw — Two gulls and a buoy (pardon me, I thought I was still at sea). Anyway, they're grand kids and a great comfort to me in my old age. So endeth my tale of the present. What the future holds, who can tell? The boys are already planning a cruise around the world in the good sloop *Mary Emma* — all 24½ feet of her! Oh to be young again!" — RALPH A. FLETCHER, *Secretary*, Post Office Box 71, West Chelmsford, Mass. HAROLD F. DODGE, *Assistant Secretary*, Bell Telephone Laboratories, 463 West Street, New York 14, N.Y.

1917

Our archivist, Tom Meloy, visited us in Boston recently. The Class Book, which is being published under his direction, is progressing nicely, but many who have not returned the questionnaire which was sent out some time ago are going to make the book unnecessarily incomplete. Your record may seem rather drab and uninteresting to you, but there will be someone in the Class who is interested in what you have been doing. Ras Senter wrote us after the reunion that he had never seen such a large number of presidents, vice-presidents, and other executives assembled under one roof. Don't let all this brass disturb you. Tom wants your questionnaire regardless of title. If you have lost your copy, please write to Tom Meloy, 347 Madison Avenue, New York 17, N.Y., or to your Secretary, and another copy will be promptly mailed.

We thought we had seen the ultimate in long-winded names during the era of the war agencies, but we take our hats off to the Course VII boys, as typified by Thurber Fales, director of the statistical section of the Baltimore city health department. He is vice-chairman of the E.C.P.S.D.R.I.L.-D.C.D. The easiest way to explain all this is to quote from a letter recently received from Fales: "I am sailing in the *Queen Mary* on October 10 to attend the second session of the Expert Committee for the Preparation of the Sixth Decennial Revision of the International List of Diseases and Causes of Death. The committee was appointed early this year by the Interim Commission of the World Health Organization and consists of nine members selected from nine different countries. At its first session held in Ottawa, Canada, on March 10, Dr. Percy Stocks, chief medical statistician of the General Register Office of England and Wales, was elected chairman, and I was elected vice-chairman. I shall be in Geneva approximately a month and shall be back in the States about the middle of November." Congratulations, Thurber, on this recognition of your high standing in your profession.

Bud Knapp writes that he had a pleasant get-together with Al Chase of Foxboro and Roger Brown, who is doing research chemical engineering for the Armstrong Cork Company of Lancaster, Pa. — We are indebted to Dick Loengard for the interesting news item that our class golf champion, Kid Corcoran, won all three of his matches in the Leslie Cup tournament. — We learn from Fred Stearns that his son, Frederick P., who was graduated from the Institute in June, 1946, married Helen S. Sullivan of Augusta, Maine, on August 2. — Haig Solakian also rates the society column with the information that his daughter Dorothy, a senior at Skidmore, has changed her major to housekeeping since her marriage to Edmund Lysle, Jr. Haig has recently been elected chairman of the New Haven chapter of the American Society for Metals and attended the National Metal Congress in Chicago in October.

Jim Flaherty is now hanging his architect's shingle from 755 Boylston Street in Boston. — Paul Bertelsen gets to Boston occasionally, still maintaining his residence at Beverly Farms, but has his business in Kentucky, where he is engaged in mining fluor spar. We gain the impression that Kentucky is just about the worst place in these United States, but that if one is destined to be the fluor spar king of these same United States — and that is Paul's announced goal — it cannot be attained by hanging around the delightful North Shore of Massachusetts. — Dick Hardwick, who, we mistakenly thought, was still in the investment business in Boston, is running a ladies' apparel store in Melrose. He, Ray Blanchard, and your Secretary hobnob as bank directors in Melrose and on the golf course. — A recent article in the Philadelphia *Enquirer* on the Navy Air Service speaks of Captain Charles M. Ewan, who joined the Navy after graduation in 1917. He is in charge of a reserve unit made up of 300 officers and 1,000 odd enlisted men at Willow Grove, Pa.

Tubby Strout made his debut as a member of the Alumni Council at the October meeting. We now have six of our Class on the Council, and if you have any pet project we shall be glad, for a small service charge, to lobby it through. There is more to that pun than meets the eye. — RAYMOND STEVENS, *Secretary*, 30 Memorial Drive, Cambridge 42, Mass. FREDERICK BERNARD, *Assistant Secretary*, 15 Hillside Road, Wellesley Hills 82, Mass.

1918

The days shuffle along in stately fashion, and now Christmas is upon us once again. Here's one time in the year when most of us behave like human beings. We are generous, cheerful, kind, and show a momentary glow of good will toward our families in particular and almost everybody in general. This year the glow should include M.I.T., because at the time of our 30th reunion in June we are presenting the Institute with an electric organ. A committee has been appointed, Harry Camp (himself long a church organist) chairman. If Professor Ralph Hudson '07 is not also a member, he certainly will be consulted, because he is both an organist and a technical consultant to electric organ manufacturers, and the man who runs the details of graduation. Perhaps following the baccalaureate service, perhaps as part of it, maybe the Saturday before, certainly on some special occasion during the graduation period, we shall have an organ recital and a little dedicatory service at which the keys to the instrument are formally presented to Technology. Presumably Harry Camp will play and Alexander Magoun will make the presentation.

Why think about this at Christmas? For one thing, it concerns giving, as already pointed out. For another, like the cost of living, the cost of organs has gone up about 50 per cent, and we shall have to raise another thousand dollars if we are to purchase an acceptable instrument. Contributions may be sent directly to Mr. H. S. Ford, Treasurer of M.I.T., and earmarked for the 1918 Organ Fund; or they may be sent to me, or to Professor F. A. Magoun, Room 1–138, M.I.T. — GRETCHEN PALMER, *Secretary*, The Thomas School, Rowayton, Conn.

1919

The Worcester, Mass., *Telegram* on September 5 contained a story headed "Chinese Industrialists Here to Purchase Materials." S. K. Lau, President of the Great China Electric and Ceramic Company of Shanghai and a member of the China Reconstruction Commission of the nationalist government, was one of the Chinese industrialists who visited this country. This was his first trip to the States in 27 years. Your Secretary regrets that he did not see Mr. Lau when he was in New York.

William B. Snow, President and Treasurer of the Middlesex Products Corporation of Cambridge, Mass., is also president of the Coated and Processed Paper Association. He has three children, aged three, five and eight and resides at Westwood, Mass. — Jacob S. Braverman dropped a line dated October 9, stating that he had attended the steak-stein dinner of the Technology Club of New York, at the Jacob Ruppert Brewery on September 18. He sends his best regards to the fellows of 1919.

Daniel H. Brown of Lebanon, N.H., wrote your Secretary, and we are pleased to add another member of the Class to our active list. At the time we produced the "25 Years After" book, we did not know Dan's location. Dan runs a department store in Lebanon and has also been engaged in real estate. Dan has two grown sons, both of whom are attending the University of New Hampshire. We shall all look forward to seeing Dan at our 30-year reunion in June, 1949.

Marshall C. Balfour, now residing at 3111 North Charles Street, Baltimore 18, Md., has just returned from Shanghai and is spending a year at Johns Hopkins in the school of hygiene and public health, doing graduate work for review and refreshment and also some teaching. Bal's older daughter, Nina, was married in September. We all look forward to seeing Bal during this year.

Dan Hall dropped your Secretary a line to say that he has just been made director of laboratories (research, development, and control) for the Calco Chemical Division of American Cyanamid Company at Gloucester City, N.J. His present home address is 37 Fifth Avenue, Runnemede, N.J. Dan's older daughter is married and living in Baltimore and doing medical research work in a hospital there, after graduation from Western Maryland College in 1943 with a B.S. degree. His son has begun his third year at the Naval Academy at Annapolis, Md., and his younger daughter, 12½ years, has started her seventh grade at school. He adds, "So, like the rest of the 1919 men, I am showing a little wear. I am looking forward to our 30th year reunion two years hence. Remember me to any of the boys you see, and if any of them ever get to Philadelphia, I hope they will look me up."

Thomas H. Bott, Jr., Treasurer of the Beverly Savings Bank, Beverly, Mass., has been appointed chairman of the public relations committee of the National Association Mutual Savings Banks. His daughter, Joan, is a senior at Mount Holyoke College and is 21 years old. — B. H. Bristol writes from Foxboro, Mass., "Doing business at the same old stand. I spent two weeks in London the first of September and was glad to get back but can't help but have a lot of respect for the way British businessmen are carrying on. The U. S. A., with all its weaknesses, still looks pretty good to yours truly." —

EUGENE R. SMOLEY, *Secretary*, The Lummus Company, 420 Lexington Avenue, New York 17, N.Y. ALAN G. RICHARDS, *Assistant Secretary*, Dewey and Almy Chemical Company, 62 Whittemore Avenue, Cambridge 40, Mass.

1921

It is with regret that we record the passing on September 24 of Maurice Garthwaite Townend, XV, of Charlotte, N.C. On behalf of the Class, our sincere sympathy is extended to his family. Moxie was born in Fitchburg, Mass., on February 27, 1900, and entered the Institute in 1917 from the Fitchburg high school. A member of Theta Xi, he was active in Corporation XV and on the Walker Memorial Committee as well as serving as a director of the Coop. Married in 1926, he is survived by his wife, Marion Frost Townend, and two daughters, Jane and Judith.

Immediately after graduation, he became associated with the Parks-Cramer Company, textile manufacturers, and served in numerous capacities, most recently as vice-president, manager of the Charlotte plant, and a member of the board of directors. He was a past president of the Charlotte Engineers Club, a member of the Executives Club, former president of the Men's Bible Class of Christ Church, chairman of the music department of the Mint Museum of Art, treasurer of the Mental Hygiene Society, advisor of the Boy Scout Troop of Christ Church, and one of the leaders in the 1947 Community Chest campaign. We are indebted to Beau Whitton '33, Honorary Secretary of the Institute in Charlotte, for his courtesy in sending us clippings from the Charlotte newspapers.

Harry P. Field is serving as a district governor of Rotary International, having been elected at the convention held in San Francisco to supervise the activities of the seven clubs in Hawaii. A former president of the Rotary Club of Honolulu, Harry is manager of the commercial department of the Hawaiian Electric Company, Ltd., with which he has been associated since 1926. He is vice-president, treasurer, and a director of the Honolulu Young Men's Christian Association, a director of the Honolulu chamber of commerce and a member of the Electrical Examining Board. He is also a trustee of the Central Union Church in Honolulu, a member of the Territorial Retirement and Pension Commission, a director of the Honolulu Electrical Club, and a member of the Pacific Coast Electrical Association.

We missed seeing Herbert C. DeStaebler during his stay in New York but learned that he is receiving congratulations on his election as vice-president of the Lambert Pharmacal Company of St. Louis. Herb's achievements in turning out top-notch products are not limited to his Listerine — witness the fact that Herb, Jr., of the Class of 1950 at Technology, is listed in the highest group of the recent Dean's list.

George F. B. Owens is back at his job as assistant vice-president of the Brooklyn Union Gas Company, Brooklyn, N.Y. He was commissioned a lieutenant commander in the Navy in 1943 and served as executive officer and commanding officer of the Seventh Amphibious Training Center at Milne Bay, New Guinea. He was retired in 1946 with the rank of commander.

We learn from Myron Bakst that John A. Scott of General Electric, Schenectady, took an active part in the National Research Council conference on electrical insulation, which was held at Technology in September. Doc Smith reports that T. Dillwyn Dutton is with the American Telephone and Telegraph long lines department in Washington, D.C. Can anyone supply the address of Earl H. McBroom of the California state division of highways, who formerly lived at 4930 7th Avenue, Sacramento, Calif.?

Paul H. Rutherford has been appointed assistant general manager of the Delco Appliance Division of General Motors, Rochester, N.Y. Most recently, Paul has been special assistant to the vice-president in charge of overseas, Canadian, Dayton, and household appliance groups. He originally joined General Motors in 1926 as an engineer in the Dayton Laboratories division which was later consolidated with Delco Remy to become the Delco Products Division. In 1936, Paul was made chief engineer of Delco Products and, in 1940, he became plant manager. In 1942, he went to Detroit to join the General Motors headquarters personnel staff handling negotiations with labor and the War Labor Board.

Thomas B. Card has been in Dhahran, Saudi Arabia, representing International Bechtel, Inc., of San Francisco, with a group of American engineers who are serving as advisors to the Arabian Government. Tom lives in Cambridge and served in the Army Engineers for four years during World War II, retiring with the rank of colonel. Before the war he was a civil engineer and surveyor in New Bedford, Mass., engaged in many government and private projects in that area.

In September we were delighted to receive a visit from Helier and Graciela Rodriguez of Havana, Cuba, who had carried out the plans they outlined at Osterville for their 1947 trip to this country. Flying from Havana to New Orleans and then to Los Angeles early in August, they drove to San Francisco and across the country via the Grand Canyon, Bryce and Zion national parks, and the Yosemite Valley to Chicago. After a session with Bill Plummer in the Windy City, they stopped off in Cleveland to see Bob Miller and Joe Gartland. The return journey from New York was made via one of Edmund Whitman's United Fruit boats. Helier is president of the M.I.T. Club of Cuba, president of the San Augustin Sugar Corporation, and owner of the America Theatre in Havana.

Ernest R. Gordon, former general manager of the Gold Coast Banket Areas, Ltd., is now employed as a mining engineer in the Mexican mining division of the American Smelting and Refining Company. His address is 2029 Crescent Drive, El Paso, Texas. — Allen Addicks of wrestling fame (and the model for the statue of the wrestler in the Fine Arts Club adjoining the old Gramercy Park location of the Technology Club of New York, in case you didn't know) is back in Gotham. Al is eastern manager for the Robbins Publishing Company, publishers of *Gas Age*, whom he previously represented in Cleveland. He was married during the war and is living temporarily in New York City while his house in Great Neck, Long Island, is being completed.

Donald J. Swift is with the process engineering section of the Consolidated Edison Company of New York, 4 Irving Place, New York City, according to Earl Thomas '22 of that company. Leonard R. Janes of the Public Service Company of Northern Illinois, had charge of the arrangements for inspection trips during the midwest general meeting of the American Institute of Electrical Engineers in Chicago. Palmer Scott's famous catboats continue to be featured in the newspaper advertising and displays of the department store boat showroom on the Avenue of the Americas, New York.

George Chutter supplements Mel Jenney's report on the dinner which Course VI-A men tendered to Professor Bill Timbie on the occasion of his retirement, with the information that Harry Witherow was also present. A. Royal Wood served as toastmaster; he and Ted Rose were among the group organizing the dinner. A William H. Timbie Scholarship is being established at the Institute.

John W. Barriger, 3d, that dashing young man about country, continues as one of the nation's most-sought-after speakers when he isn't exercising his presidential responsibilities in the betterment of the Chicago, Indianapolis and Louisville Railroad, popularly known as the Monon. He addressed the New York Railroad Club in October on the subject "Two-way Communication between Management and Employes." That Jack's leadership is pointing up public relations as well as the Monon's real property is indicated by the unusually courteous and capable handling of our inquiry to the line's New York office, in sharp contrast to the normal experience in telephoning to railroad offices in these parts. Jack says that his older son, John, is vice-president of the Class of 1949 at the Institute and that Stanley, who is 14, is also headed for railroading via Technology. At last reports, Jack was participating in the 100th anniversary ceremonies of the International Harvester Company, which coincide with the 100th anniversary year of the Monon.

Through Stan Fenton we learn that Nicholas Ottens is the general manager for India and Burma for the American Foreign Insurance Company. Nick is still enjoying blessed singleness. He recently left his Bombay headquarters after a visit to this country early this year and is now in Africa, where he is setting up additional offices for his organization.

Writing from his home in New York City, Dan Harvey says he has resigned as executive vice-president of the Dorr Company and is now active in two new enterprises. Dan continues, "On one, the Paul Valve Corporation, I have a place on the board and am active as vice-president for sales. You may have seen this valve written up in the International Nickel Company's publication 'Mechanical Topics' under the heading 'Bernoulli Carries the Ball.' It appears to offer an entirely new principle for controlling flow with a number of good applications. Production and sales are just getting under way. The company was formed in June, and shortly afterward the other venture, the Ice-Flo Corporation, came into being. This is built around the

invention of a machine to freeze and store ice cubes automatically and to discharge them as needed. As you will suspect, bars and hospitals are among the users. Through considerable work in its organization, I went on the board when the company was formed and am contributing also to the marketing, advertising, and sales activities."

Sanford J. Hill of E.I. du Pont de Nemours and Company, Wilmington, Del., is the newest addition to the Secretarial Committee. Under date of October 9, San says, "I am today completing 25 years with the Du Pont Company. I recall that Frank Flaherty remarried in August and, when I asked him for a note, he wrote the following: 'On August 1, the Little Church Around the Corner witnessed the marriage of Mrs. Hobart O. Davidson to Franklin T. Flaherty, X, raising the number of his children from three to five and making him a grandfather forthwith.' " A clipping from the New York *Times* adds: "The bride is the widow of Mr. Davidson ['20], who at his death in 1945, was chief engineer of the American Viscose Corporation of Wilmington. Mr. Flaherty is a patent lawyer with Du Pont."

William H. Rose is vice-president in charge of manufacture for the Charles F. Abbott Company, Inc., electrical specialty manufacturers of East Orange, N.J. He remarried last year, and his wife is the former Mrs. Helen Stiles Thompson of New Haven. They are making their home in Morristown, N.J., with the two younger daughters. The older daughter is married, and Bill has joined the Grandfather's Club. The boy, who is 18, is in the Marines and has been stationed in Quantico, Va.

Maxine and your Secretary had a most enjoyable visit with Helen and Ray St. Laurent in Manchester, Conn., and with the Martes at Giants Neck. Saul Silverstein is president of the Rogers Corporation in Manchester, and Ray is vice-president in charge of sales. At the trim Rogers plant in Goodyear, Conn., we had an all-Technology luncheon which was attended by Joe Lurie, who is director of research for Rogers. Ray writes that John J. Healy, Jr., assistant general manager of the Merrimac Division of the Monsanto Chemical Company, Boston, has been nominated as a director of the American Institute of Chemical Engineers. John has been with Merrimac since 1921 and is a former chairman of the Boston section of the A.I.C.E.

A very merry Christmas and the tops in New Year greetings from Ray, Lark, Chick, and your scribe. — CAROLE A. CLARKE, *Secretary*, International Standard Electric Corporation, 67 Broad Street, New York 4, N.Y.

1923

Dave Skinner is able to report the successful conclusion of arrangements of a time and place for the 25-year reunion. It will be held at the Griswold Hotel and Country Club, New London, Conn., commencing on the evening of Sunday, June 13, and terminating Wednesday noon, June 16, 1948. Probably by the time these notes appear, you will have the announcement of this time and place. We want to know immediately if you are likely to be present.

A prime problem which had to be solved in choosing a time and place was to find a location which had facilities to take care of a group of the size which preliminary returns suggest is going to be present. The Griswold has excellent facilities and sufficient capacity. None of the other places could furnish adequate space, and some of them could not take us on a date that would be suitable. Under this arrangement it will be possible, for those who wish, to attend Alumni Day, Saturday, June 12, and the Alumni Dinner that night and then to proceed on Sunday to New London for our reunion program.

Walter Marder, Jr., has been appointed comptroller of the Daystrom Corporation of Olean, N.Y. The Daystrom Corporation is the world's largest manufacturer of tubular chrome steel and plastic kitchen and dinette furniture. Walt had been with Frederick Hart and Company, Poughkeepsie, N.Y., a sound equipment manufacturer, as treasurer and assistant secretary since 1944. These firms are all associate companies of the American Type Founders, and Walt is a third generation member of the A.T.F. organization. His grandfather, John Marder, invented the point system of type measurement. Walt's father was vice-president and secretary of American Type Founders for some years. When Walt left M.I.T. in 1923, he went to work for the foundry as a maintenance machinist. He later became a member of the engineering department, worked in production control, and in 1930 was made assistant to the general sales manager. In 1934, he began a period in Boston as regional sales manager, returning to the main plant at Elizabeth, N.J., at the beginning of World War II to handle a number of problems, including establishment of labor management committees in A.T.F. plants and installation of job valuation and merit rating in the main factory. He also supervised salary stabilization procedures, and in 1943, before going to Poughkeepsie, he became the company's budget director. Walt is married and lives in Staatsburgh, N.Y.

E. V. Murphree was elected on July 26 president of the Standard Oil Development Company to succeed Robert P. Russell '22. Murphree, who joined Jersey Standard 17 years ago, has contributed to many of the technical developments, . . . These include the fluid catalytic cracking process, which made possible enormous increases in the output of 100-octane gasoline for war planes; a process for synthesizing toluene which enabled unprecedented output of this component of T.N.T. at one-fifth the cost of toluene produced from coal; and a catalytic process for making butadiene from petroleum for synthetic rubber. Murphree came to Technology after graduation from the University of Kentucky and, after six years of chemical engineering work, joined the Standard Oil Company of New Jersey in 1930. Two years later he became director of research and development at the Esso Laboratories in Baton Rouge, La. In 1934, he was elected vice-president and director of the Hydro Engineering and Chemical Company, a Jersey Standard affiliate in New York. During the war, he served the Office of Scientific Research and Development as a member of the S-1 Executive Committee headed by J. B. Conant. This committee was instrumental in the establishment in August, 1942, of the Manhattan Project, which developed the atomic bomb.

Among executive promotions announced in July by Merck and Company, Inc., manufacturing chemists, was that of Per K. Frolich to be director of research and development. Dr. Frolich, who lives in Westfield, N.J., joined Merck and Company, Inc., in December, 1946. He was formerly president of the American Chemical Society, and he came to Merck from the Standard Oil Development Company of New Jersey.

Norman Weiss has written Charlie Locke '96 that late last July he resigned his job with the Dow Chemical Company at Pittsburg, Calif., and is now back with the American Smelting and Refining Company as milling engineer with headquarters in Salt Lake City. During the first four months of this year, he visited the nonferrous metal mines of Central America, Ecuador, Peru, Bolivia, and Argentina. He ran into a number of Technology miners during his trip. A month ago he was in Denver and got in touch with John C. Flaherty, who is in building construction work there. John served Norman in good stead by performing the miracle of finding an apartment available in Salt Lake City through one long-distance call. His present home address in Salt Lake City is 804 East Third South Street.

Philip S. Wilder is secretary of the Alumni Association of Bowdoin College at Brunswick, Maine. A clipping from the Lewiston, Maine, *Sun* for June 23, tells of the marriage of his son, Philip S., Jr., to Barbara Fluker of Waban, Mass. Another son, Charles W., served as his brother's best man. The couple planned to spend the summer at Brunswick and return in the fall to Cambridge. Philip, Jr., will take up graduate work at Harvard, and Mrs. Wilder will teach at the Dedham Country Day School.

Alvah G. Hayes is principal of the Johnson High School in North Andover. He has introduced his trigonometry students to practical applications of that subject in surveying. According to the Lawrence *Tribune*, this has been received very well by his pupils. — The *Long Island Press*, published at Jamaica, N.Y., ran a feature story on July 13 about Herbert N. Leisk. Leisk now operates an office in the Chamber of Commerce Building at 39-01 Main Street, Flushing, and is one of the top borough experts in the field of realty appraising.

I regret to have to report the death on August 2 of Philomena Caputo of Belmont. She was, I believe, the first woman graduate from the architectural engineering course. She worked for a number of Boston engineering firms and for the State of Massachusetts. A clipping in the Boston *Globe* reports that she was a member of the Italian Historical Society and had been active in Italian charitable affairs. Belated information has also come in about a number of other deaths: John A. Sauers on May 25, 1941; Dominic E. Milone on December 5, 1946; Thomas W. Conrad on February 14 of this year, and Bruce M. Mossman on August 7. I also have word from his widow that Ilya M. Georgevitch of Zaitchar, Yugoslavia, an architect and life member of the Alumni Association, was killed by the Germans on September

25, 1943. Besides his widow, he left three children. — HORATIO L. BOND, *Secretary*, National Fire Protection Association, 60 Batterymarch, Boston 10, Mass. HOWARD F. RUSSELL, *Assistant Secretary*, Improved Risk Mutuals, 60 John Street, New York 7, N.Y.

1926

The sudden death of Walter H. Emerson on August 19 was a shock to his many friends in the Class. Widely recognized as the pottery industry's leading authority on plant layout and power application, he had since 1934 been chief engineer for the Homer Laughlin China Company of East Liverpool, Ohio. Among his notable contributions to plant mechanization in the pottery field were the automatic jigger, automatic glazing, automatic lining and banding, and conveyorizing. Jim Offutt, one of his close friends in the Class, writes: "It was my good fortune to see Walter the first night he came to East Liverpool and over a period of years to follow his tremendous contribution to the pottery industry. He was, without a question, the outstanding engineer in this field. . . . He was an inspiration and help to many of his classmates, to whom his hospitality and friendliness were always extended."

To Mrs. Emerson, their daughter, Ann, now a freshman at Wellesley, and their younger son, Paul, the Class extends sincere sympathy.

Did you know: That John B. Jacob is executive director of the Research and Development Board? That Shih M. Chu is a member of the Chinese delegation to the United Nations? That Thomas S. Washburn is chairman of the iron and steel division of the American Institute of Mining and Metallurgical Engineers? — JAMES R. KILLIAN, JR., *General Secretary*, Room 3–208, M.I.T., Cambridge 39, Mass.

1927

As a result of Ernie Dodge's transfer from New York to Atlanta, our bloodhounds were able to catch up with him, and he has written his activities from 917 Hurt Building, as follows: "As you may remember, I work for the long lines department of the American Telephone and Telegraph Company and had been located in New York City ever since 1927. In January, 1945, I took over the job of division service supervisor in our Division 9, which covers the states of Kentucky, Tennessee, Alabama, Mississippi, and Louisiana. Then a year ago, on October 1, 1946, I moved over into Division 3 covering Georgia, North and South Carolina, and Florida. Since the headquarters for both divisions is Atlanta, I didn't have to move the family on that last transfer. We have two girls, Carol, eight years and Judy, five years, and we all like Atlanta very much. We have made some fine friends here. Charlie Richheimer is in Jacksonville. I've talked to him on the telephone but haven't yet seen him."

Ike Stephenson has been with American Airlines for the past year at Flushing, Long Island. Lately he resigned from American, bought a surplus BT-13, and when last seen was headed west for a dude ranch business. Send in news. — JOSEPH S. HARRIS, *General Secretary*, Shell Oil Company, Inc., 50 West 50th Street. New York 20, N.Y.

1928

Congratulations to Harold T. Blackwood, erstwhile member of the 1928 boxing team, on his marriage to Margarita Olivia Rosas in Mexico City on October 8. Harold is manager of the Eagle Picher Mining and Smelting Company in Mexico.

Howard P. Emerson, who entered our Class as a junior in Electrochemical Engineering and has been with the Tennessee Valley Authority at Knoxville since 1933, has been named as head of the department of industrial engineering at the University of Tennessee. Before his association with T. V. A., Howard has held various industrial engineering positions in West Virginia, New Jersey, and Tennessee. For the past five years he has been assistant to the director of the T. V. A. commerce department and has been special lecturer in industrial engineering at the University of Tennessee.

On October 10 the funeral ship *Honda Knot* arrived in San Francisco, returning to the United States the first group of Pacific war dead. Included among the Navy dead was our good friend and captain of basketball in our senior year, Norman C. Estes from New Bedford, who at the time of his death was a lieutenant commander in the Seabees. As many men will remember, Norm was secretary of our Class during our senior year and very active in the M.I.T. Athletic Association as well. Before applying for a commission in the Seabees at the outbreak of the war, Norm was located in Texas as representative for the Wallace and Tiernan Company. He and Malcolm O. Petrie are the only two members of our Class who died while serving in the armed forces. Since there were nearly 175 classmates in uniform, it is indeed most fortunate that this number was no larger. Both Norm and Mal will be very much missed at all future gatherings of the Class.

Word has been received that Hector E. Hagedorn is now associated with the Philippine War Damage Commission. His address is A. P. O. 900, in care of Postmaster, San Francisco. — Among the recent visitors to Cambridge was Gabriel M. Disario, I, who now is a member of a consulting engineering firm in Caracas, Venezuela.

I am trying to get together some news each month for The Review and would greatly appreciate your forwarding to me at my address in New York, or to Ralph at M.I.T., word about yourselves and your experiences, so that our record in The Review will be better than heretofore. We can report the news but we can't make it. — GEORGE I. CHATFIELD, *General Secretary*, Alden Estates, 33 Priscilla Lane, Port Chester, N.Y.

1929

At long last a few items — some old and some cool. We note that Ed Tittmann, who was manager of the East Helena plant of the American Smelting and Refining Company, was promoted to managership of the El Paso plant of the same company. Ed not only manages the El Paso plant but is also chairman of the El Paso mining committee which will arrange the International Mining Days 1947 celebration and the western division convention of the American Mining Congress.

Al Tammaro of Providence, R.I., architect, has been named acting manager of the Atomic Energy Commission's Chicago operations, including the Argonne National Laboratory. During the war, Tammaro was assistant to the engineer of the Manhattan district. He remained with this organization during its development of the atomic bomb and atomic energy plans until recently, when the Atomic Energy Commission took over and he assumed this new position.

A clipping from Rhode Island reports that Fred Celler has been appointed works manager of the East Greenwich plant of Textron. Before joining Textron in September, 1946, Fred was a naval aviation engineering officer. Assuming this new position will make Fred a key figure in the development and expansion of this plant, and we certainly wish him luck.

Sperry Gyroscope announces the appointment of W. L. Barrow to the position of chief engineer. Barrow was previously on the staff of the Electrical Engineering Department at M.I.T. and has been with Sperry since 1943 as the director of armament engineering. Dr. Barrow is widely known in military, naval, and scientific circles and particularly for his early contributions to the development of microwave, communications, electronics, and radar.

Arthur Pistolas, a former major in the Army, has announced the reopening of his contracting business in Nashua, N.H. He closed this business in 1943 when he enlisted in the service.

S. J. Levine was appointed managing engineer of the automatic heating equipment division in the Bloomfield plant of the General Electric Company. Levine, who has been affiliated with the heating division since 1934, was formerly an engineer in the General Electric research laboratory at Schenectady.

It seems that E. Gunnar Peterson has made quite a name for himself throughout Cape Cod, since his knowledge and interest in architecture has made him one of the most reliable old colonial architects on the Cape. Because of this, quite a long and interesting editorial was written that certainly did him justice.

If any of you have any extra dimes, do you suppose you could send them along to Gordon Browne, Main Street, Leicester, Mass.? Gordon alleged he was ejected from a Worcester Street Railway Company bus and sued the company to recover the ten-cent fare. After a brief hearing, however, the judge awarded the dime to the company. Although this happened quite some time ago, I'm sure Gordon still feels the loss of that ten cents. It's just the principle of the thing! — FISHER HILLS, *Acting Secretary*, Dewey and Almy Chemical Company, Cambridge 40, Mass.

1931

Thanks to the thoughtfulness of Fred Nordsiek, we have a bagful of news about our Course VII brethren with which to open the chronicle of 1947–1948. The following letter arrived from Fred some months ago: "The past two weeks have afforded me more opportunities to see '31 men than I have enjoyed during most of the years since graduation. First, the meetings of the Institute of Food Technologists

in Boston during the week of June 2 brought together a number of 'old Course VII' men, including Wendell Currier of the Campbell Soup Company, Bob Phelan of the Beech-Nut Packing Company, Bryce Prindle of the Plymouth Cordage Company, and Wally Tibbetts of the Dobeckmun Company. At the clambake following the meetings we had the pleasure of meeting Bob Phelan's most attractive wife. Then, before leaving Boston, I visited Helge Holst at Arthur D. Little, Inc. Helge still retains his title of assistant to the president but was recently elected assistant treasurer, which makes him an officer of the company. He has three children and still pursues his musical and athletic hobbies with characteristic vigor. Finally, the week after the I.F.T. meetings, I went on a junket arranged by the New York section of the Society of American Bacteriologists, to the Lederle Laboratories at Pearl River, N.Y. There I stumbled on Gil Ayres, who has been in charge of the Lederle penicillin plant since his release from the Army. Gil also has three youngsters. There are no changes to report for myself, as I am still assistant director of the department of applied research for Standard Brands, Inc., New York. My most active avocations at the moment are writing, which borders on being a side-line vocation, and square-dance calling." Fred is a bit modest about his writing. He is a frequent contributor to The Review and one of its editorial associates.

Wendell Currier continues the story of Course VII as follows: "My postgraduate life has been decidedly unspectacular, as you will see. . . . I have been what you might call an ordinary suburbanite — and still am — a family man, who has stuck to one rather prosaic job for 16 years. I began as a chemist and bacteriologist in the plant laboratory of the Campbell Soup Company in July, 1931, and have been with the same company continuously. After two and one-half years, I became chief chemist in charge of the lab, where I remained for 10 years. About three and one-half years ago, I was promoted to the job of technologist, in charge of all quality control at the main plant in Camden. This includes inspection in the plant as well as laboratory control and requires a staff of about 80 people. Meanwhile, I have found time to acquire a wife and two boys, aged 11 and six, who will shortly run circles around the old man. I have kept my connection with the Philadelphia Technology Club, serving as treasurer for two years and on the executive committee for several more. I am secretary of the local Kiwanis Club, sing in the church choir, and do what is generally expected of the 'solid citizenry.'"

And then, to round out the Course VII picture, Gil Ayres dropped into the office in Cambridge not long ago while vacationing in New England. Gil has been with American Cyanamid since 1937 with the exception of four years requisitioned by Uncle Sam. During those four years he was in intelligence, for the most part with the 37th Infantry Division in such places as the Solomons, the Philippines, Guadalcanal, and New Georgia. After the Japanese surrender, Gil served with the Inspector General, emerging as a lieutenant colonel in the Reserve. Upon his return to American Cyanamid he was put in charge of the production and development of penicillin at their Lederle Laboratories in Pearl River, N.Y. He has a nine-year-old girl, and boys approximately six and one.

Course X men will recall Lombard Squires, who was on the Chemical Engineering staff at the Institute for a number of years and is affiliated with the Class of '31. The Du Pont Company recently announced Squires' appointment as assistant production manager of their ammonia department, with headquarters in Wilmington, Del. Squires has been with the company since 1938, first in the Experimental Station and later in the explosives department. In 1944, he was assigned as chief supervisor at the Hanford Engineer Works and later became technical supervisor.

For the sake of the record, some mention should be made of 1931 attendance at the Alumni Day banquet in the Statler Hotel in Boston last June. A grand total of four of the Class put in an appearance: Gordon Brown, Professor of Electrical Engineering and Director of the Institute's Servomechanism Laboratory; Wy Boynton, our country lawyer and budding political figure from Portsmouth, N.H.; Harold Davis, now with Sylvania Electrical Products; and your humble correspondent.

Donald Herbert of the late lamented Mining Department contributes a plaintive comment on the current cost of living. Herbert, a captain in the Army, returned to this country recently after an overseas tour in Germany. He says he had considered himself fairly well off financially until he discovered that he had waded through $1,500 during his two months in the States with nothing more to show for it than train tickets and hotel bills. He is now an R.O.T.C. instructor at the University of Indiana, where he is studying petroleum geology with one eye on Mexico, a country he saw quite a bit of before the war. He had the foresight to marry a girl who speaks Spanish fluently.

A sprightly publication of the M.I.T. Club of South Florida, entitled "Tech Men," is the source of the following information about Carl Orleman, a fugitive from Course V and former captain of the M.I.T. boxing team. Carl was a captain in Chemical Warfare, serving in the European Theater of Operations for more than three years. He was chemical supply officer for the Southern Division in England and later was assigned to G-2 of the Supreme Headquarters of the Allied Expeditionary Forces in Versailles. He is now back in Miami with the Post Office Department.

And now that you have all seen what the biologists can do in the way of belles-lettres, how about some evidence that other departments of the Institute produced '31 men who can read and write? — JOHN N. HIGGINS, *General Secretary*, M.I.T., Room 5-105, Cambridge 39, Mass.

1932

Don Gilman has prepared the following report on our 15th reunion, and I am sure that you will agree with me that it was worth waiting one issue to read. We trust that those of you who were unable to make it will be properly envious and resolve to be with us at the 20th. This one was held at Wentworth-by-the-Sea. Fifty-six members of the Class arrived in high spirits on June 7, laden with golf clubs, tennis rackets, and the bottled wherewithal for sustained merriment.

Classmates having been adorned with painters' caps, the festivities began with golf, tennis, and chemical research at the bar on Saturday afternoon, followed by the banquet in the evening, at which the guest of honor, Professor Raymond D. Douglass '31, with his usual deftness put the membership through a differential workout around a hyperbola integrated with praise and insult and was cordially invited to say it again at the 20th.

The golf prizes awarded at the banquet, according to a gin-soaked paper turned in by Joe Welch, were: Low Gross — Del Cannon 85, Second Low Gross — Elton Buckley 86, Low Net — Jim Snow and Al Newcomb 71, High Gross — John Kelton 117, High Net — Tom Regan 82, Most Sevens — Chippy Chase 4, Most Eights — Jim Snow 3, Blind Bogey — Bill Barker 75. (Anyone knowing the whereabouts of the bottle of Scotch won by Elton Buckley is requested to forward it to him.)

Fifty or more other prizes were distributed for other reasons or for no reason at all. Screw drivers were given by Howard Imray; plastic handles, by the Tennessee Eastman Corporation; "Pikup" and kitchen bags, by John B. Calkin of the Union Bag and Paper Corporation; Pequot sheet and pillow cases, by Chesler L. Pattee of the Naumkeag Steam Cotton Company; Newport sausage, by Joe Welch of the J. M. Welch and Company, Inc.; "Rain Bean" fishline, by Freeman W. Fraim; portable multi-tap, by W. B. Pearce of the Albert and J. M. Anderson Manufacturing Company; door closers, padlocks, knocker, and jimmyproof lock, by George Falk of the Independent Lock Company; six-by-16 tire, by Bill Barker; Aerosol bombs, by Elton Buckley; bottles of whiskey by Louis Vassalotti and Don Gilman; one bottle of bourbon by an unnamed person attending a bankers' convention in another part of the hotel.

After the banquet the glasses tinkled far into the night at poker, crap, and bull sessions (at which many important scientific and technical matters were settled with great clarity and finality), interrupted occasionally by side excursions into the bankers' dance. Forty members of the Class were required to rouse Welch and Regan for golf in the rain on the following morning. The Old Boys of the Class of 1917 ran out on our challenge to a softball game, but Lobby provided tall glasses of tomato juice for breakfast for our entire Class. Mel Castleman was busy at all times with his camera, and many of those present may want to get in touch with him for copies of his snapshots. Intermittent rain prevented having the Sunday noon clambake on the beach as planned, although it was cooked on the beach and carted into the hotel where, with half a case of beer per man, the Class enjoyed a clambake to end all clambakes: a delirium of chowder, steamed clams, baked fish, fried clams, and lobster.

The party broke up regretfully in the middle of Sunday afternoon only after solemn resolutions had been passed to schedule the 20th reunion for three days instead of two and to organize annual reunions hereafter between Boston and New York, for as many as are near enough to

attend. The final touching notes were Bill Barker's golf clubs and Bill Spreen's carefully folded suit, deserted on the barren porch chairs as the last man left.

Attendance consisted of the following: William Barker, Philip T. Boothby, Julius Brody, Donald W. Brookfield, John J. Brown, Elton V. Buckley, Delano C. Cannon, Melvin Castleman, Frank S. Chaplin, *Clarence M. Chase, Jr., Don E. Corson, *George R. Daniels, Alexander D. Daunis, Raymond D. Douglass '31, Addison S. Ellis, George W. Falk, Joseph C. French, *Donald B. Gilman, Frederick W. Green, Walter L. Guzewicz, Addison S. Hall, James E. Harper, Jr., Richard Huessener, Stanley L. Johnson, John T. Kelton, Albert D. King, Eugene F. Lynch, Eugene B. McBride, Robert D. McGilvra, Edmund F. McLaughlin, Arthur M. Marshall, Martin T. Meyer, Robert E. Minot, Henry B. Mitchell, *H. Kelsea Moore, Jr., Willis M. Moore, Jr., George W. Muller, Jr., *G. Edward Nealand, E. Allen Newcomb, John D. Northup, Almer H. Orr, Jr., William B. Pearce, Robert S. Prescott, Thomas W. Regan, Frederick C. Reese, *Herbert F. Ross, *Thomas E. Sears, Jr. (chairman), Harner Selvidge, James T. Snow, William F. Spreen, Jr., Harold A. Traver, *Louis J. Vassalotti, Herbert M. Wagner, *Joseph Welch, Jr., *Donald Whiston, Robert W. Wright.

Those identified with asterisks were members of the committee, to whom the Class is greatly indebted for planning and executing a most enjoyable and successful reunion. — CLARENCE M. CHASE, JR., *General Secretary*, 1207 West Seventh Street, Plainfield, N.J. *Assistant Secretaries:* CARROLL L. WILSON, United States Atomic Energy Commission, Washington 25, D.C.; WILLIAM A. KIRKPATRICK, Allied Paper Mills, Kalamazoo, Mich.

1937

We have at last a hail from Ross Elliot Black, XIII, whose wanderings have been far and wide, although his clipped version makes them sound so very simple: "The enclosed [an announcement of his marriage on August 21 in New York to Maria Matilda Beatrice Ellingford, who was, we believe, a British naval nurse] may be of some interest for the class notes, if you run short of material. Just to bring the record up to date, I got back from China and out of the service in December, 1945, spent a term at Tech under the G.I. bill taking Course I subjects and a year in Fay, Spofford and Thorndike's office in Anchorage, Alaska, then came back stateside to get married and go to work for Merritt-Chapman and Scott on the new Potomac River bridge job here in Washington. I haven't run into any Technology graduates so far except Jim Surprenant '38, who is on the bridge job, too." — WINTHROP A. JOHNS, *General Secretary*, 34 Mali Drive, North Plainfield, N.J. PHILIP H. PETERS, *Assistant Secretary*, 7 Kirkland Circle, Wellesley Hills 82, Mass.

1938

On September 6, at a Friends' ceremony, Carol Stokes was married to Lloyd Bergeson in Moorestown, N.J. Doug Esperson and Gordon Foote were among the ushers. Carol and Lloyd are to live in New York. Another bit of good news came in a note from Pittsburgh, Pa.; Jack Chapin and his wife have a new daughter, Ann Beatrice, born on September 2.

Bernard Lement, who was associated with the Massachusetts State College, is now back at the Institute as a research assistant in the Department of Metallurgy. We have some information on John Noyes. He is married, has a son and a daughter, and is living in Clayton, Mo. During the war he served as an aviation engineer for the Curtiss-Wright Corporation and the General Motors Corporation and as a helicopter engineer for the McDonnell Aircraft Corporation. He is now with George E. Wills, Inc., a group of designers and product engineers, and has been working on a new, fully automatic cleaning machine for the dry cleaning industry.

Dick and Louise Muther have returned from a year in Zurich, Switzerland, where Dick was taking some advanced studies, and are now in Pittsburgh, Pa. Dick is working for a consulting firm, Methods Engineering Council, and seems to like it very much. Ira and Louise Lohman and their two daughters are back around Beantown for six months. Ira is with the Emerson Electric Manufacturing Company in St. Louis but has been sent back to the Institute for development work in connection with some new equipment for the Army.

Shuichi Kusaka drowned while swimming at Beach Haven, N.J., on August 31. He received a master's degree with us, went on to get a doctor's in theoretical physics at the University of California, then to teaching at Smith College until 1945; and at the time of his untimely death he was an assistant professor of physics at Princeton University. — DALE F. MORGAN, *General Secretary*, Carbide and Carbon Chemicals Corporation, 30 East 42d Street, New York, N.Y. ALBERT O. WILSON, JR., *Acting Assistant Secretary*, 32 Bertwell Road, Lexington 73, Mass.

1939

Much news has come this way over the summer, via the trusty news clips and a few other sources, notably the Alumni Day functions last June. Rushing over the excerpts, we find a composite scrawl from the banquet, attended by a small but noteworthy group of '39 men, which includes words of greeting from Doc Wingard, Al Graffeo, Bill Brewster, Al Rugo, George Beesley, Irving Cohen, Morrie Nicholson, Sig Oettinger, Esther Garber, Al Schreiber, Wilson Keene, and some unidentified person who wrote on the community message: "We're hopelessly outnumbered, but our 'Eiffel' of beer cans is keeping '39, if not famous, at least conspicuous; let's all get together for a bang-up tenth reunion, which isn't too far off." These last are mighty fine sentiments — and this department is more than receptive to all kinds of suggestions.

Turning to the news items, we find the following: Pete Bernays is now a married man, to the former Marie Rasmusson, an Army nurse he met en route to Hawaii; they are living in Chicago, where Pete is an assistant professor at Illinois Tech. There's another baby girl in the Mel Falkof family — Bonnie Dee, born on May 3. John Ohlson is now working for Swift and Company, and living in Chicago. Jack Stiff is with Binney and Smith Company in New York. During the war, Jack was with the Chemical Warfare Service at Technology. He, likewise, is married and has a daughter slightly over two years old. Bill Postman is working at Calco in the Azo dye division. Another summer wedding was that of Bill Phillips to Mary Viola Ohler of Hampton, Va. Bill, incidentally, in 1945 won the Lawrence Sperry Memorial Award for notable contributions to the advancement of aeronautics, an award presented annually by the Institute of Aeronautical Sciences. Nicely done!

Dick Leghorn, we learn from the Kodak paper, sailed last July for a year's stay in England and on the Continent. Over there he will learn at firsthand more about the company's European organization and the problems of those markets. Formerly, as a lieutenant colonel, he headed the 67th Air Force Reconnaissance Group in the European theater of operations. Fred Phillips has recently been awarded a fine position with the Brazilian Government as professor of aircraft design from the United States, one of a group of 30 who will engage in this specialized work as a part of the good neighbor policy. Domina Spencer is in the news as having recently been appointed assistant professor of physics at Brown University.

Those of you familiar with the New York *Daily News* may have discovered in the Inquiring Fotographer column, of all places, the smiling face of C. Eric Olsen, who gave his worldly comments as an answer to the question: "Only about 1,000,000 Americans are mentally normal — and they are bores. Are you normal?" He squeezed out of that one neatly by saying that, although eight years out of school, he is still climbing mountains and riding rapids in canoes. Leo Kiley, as major, was recently decorated and awarded the Army commendation ribbon for meritorious service as commanding officer of the Eighth Weather Squadron in the North Atlantic. He is now assigned to Okinawa, soon to be joined there by his wife and two children, Michael and Karen Lee. Frank Spooner, now a chemical engineer with the Standard Oil Company of New Jersey, was engaged to Helen McConnell last May, and the wedding took place on September 27 in Bethlehem, Pa. Harold Posner is now president of the Pallet Sales Corporation of Manhattan.

Don Scully, who has been a lieutenant commander in the Navy, has recently become engaged to Gloria Hawkins Meyer of South Boston. Indirectly we hear that Will ver Planck is doing postgraduate work in geology at Leland Stanford University in California. And there's another Kaswell now — Jeanne Barbara, the new daughter of Ernie and his wife. We hear that Dick Hanau is now teaching at the University of Kentucky, after receiving his doctorate at Michigan last spring. During August, Frank Bent was married to Mary Elizabeth Huntsberry of Kansas City. Frank is with the Hercules Powder Company in Parlin, New Jersey. Contrary to editorial policy, this column will probably be more unpredictable than ever because of the arrival at the address below of Clifford Edward '68 on July 7. — STUART PAIGE, *General Secretary*, 701 Mill Plain Road, Fairfield, Conn. ROBERT C. CASSELMANN, *Assistant Secretary*, 271 Cypress Street, Newton Center 59, Mass.

1940

John McKee writes to Tom Creamer as follows: "I have just gotten out of the Army after an interesting 18 months at the Army Medical Center in Washington, D.C., developing improved artificial hands. I'm packing now for a move to Yonkers, N.Y., where I've signed on with the Graphite Metallizing Corporation to organize and direct a small research laboratory. My wife and son will have to remain here in Arlington until I find a place to live in New York. I haven't seen any classmates for a long time. If you're living in Scarsdale now, I'll be over soon to find out where some of the fellows are holed up."

A. E. Buller is returning to Hedley, B.C., to become chief geologist of the Kelowna Exploration Company, Ltd. — John Patrick McEvoy and Edith Ketola were married in September. After a trip to Nova Scotia, they plan to live in Orlando, Fla.

We wish everyone a merry Christmas. Please let us hear from some of you in order to have a column for the next issue. — H. Garrett Wright, *General Secretary*, Garrett Construction Company, Post Office Box 629, Springfield, Mo. Thomas F. Creamer, *Assistant Secretary*, 6 Berkley Road, Scarsdale, N.Y.

1941

Your Secretary is back at school for a term, thus accounting for recent contacts. Bill Cadogan is still grinding it out for a higher degree; he and his wife, Ruth, live on campus. Ken Bohr has left the Metallurgy Department and is studying in the Economics Department — Course XIV, for the benefit of you old-timers. Bob Sinsheimer is doing research in the Biology Department. George Newton and Rog Finch are other familiar faces. At Durgin Park we ran into Stan van Greenby of the Van Greenby Construction Company and Max Greenbaum of the Linvure (Printing) Company. Stan was officer-in-charge of the design section in the Aleutian Islands during the war, and so we swapped notes on the construction on Adak. Max was the executive officer of the inspection service for Chemical Warfare. Hank Avery is reported to be with the chemical firm of Godfrey Cabot. Other classmates are around the Institute, but we haven't run into them as yet.

Evelyn Alm was married to Carl Streed in September. Charles Jones walked the aisle with Dorothy Duemler late in August; Charles served as a pilot with the Army Air Forces during the war and then went back for his master's at the Institute. Mary Chesbro is now Mrs. Rea Stanhouse. Margaret Lydon and Bob Parry were married last August. Priscilla van Loan and Dick Tindal set October 11 as their wedding day. We met Dick in Walker Memorial the other day with another A.D. Little staff man, Reid Weedon. Reid is working on the industrial development of Puerto Rico. Julia Emerson and Alan Smith were married in September. You know, as your Secretary we have for years read wedding notices involving our classmates and have reported them briefly and directly as indicated above. No indication has been given of the descriptive wordage of the society editors through which we have had to wade. The limit has been reached, however, and we feel obliged to repeat verbatim the terse communication received after the Emerson-Smith affair. We quote: "Her grandmother's fan of ivory and rosepoint lace, entwined with tiny orchids and bouvardia, was carried by Miss Julia Ripley Emerson of Bronxville, N.Y., who wore her great-grandmother's hoopskirt gown of ivory silk, banded with ivory satin and trimmed with antique Belgian lace like her veil, when she was married yesterday in Christ Church, Bronxville, to Mr. Alan A. Smith of Boston, son of Mrs. John E. Taylor of Washington, D.C., and the late Andrew A. Smith." If you prefer our treatment, we shall continue as before. In all sincerity, our very best wishes to all the brides and grooms. We also have late notices on the engagements of Margery Miller to Jack Kriz and of Nancy Arnold to Charley King.

From Ivor Collins we have the following — "Just a note to give a little background on Rea Stanhouse over and above his recent marriage. I ran into Rea a week ago — he's working at present in the industrial controls section of General Electric and has been there about a year. After graduation he worked for General Motors in Linden, N.J., and then went to Western Electric in Kearny. After that he spent a while at Scintilla Magneto in Sidney, N.Y. Then he left for two years in the Army, about one half of it in the Philippines. I had a letter from Carl Aronsen a while back, telling some of the details of his wedding. He is still working for Bethlehem as an estimator. Nothing new from Poughkeepsie — we have about 14 Tech men around, but I'm the only '41 representative."

Bill McKenney, his wife, and two children have recently moved out to Wellesley, we were told. Bill is in the food business. Ralph Swann was recently appointed as director of research at the Bon Ami Company. He formerly worked with the American Mineral Spirits and the Pure Oil companies. Eleanor Smith is to be Mrs. Max (Cross-country) Quackenbos. Mrs. Bill Ahrendt is the former Matilda Clarke. Mary Cahil is now Mrs. Frank Regan.

J. Lester Klein writes that in June, 1941, he went to work for the Crucible Steel Company. In September, 1943, he moved to the Jessop Steel Corporation in Washington, Pa., and was advanced in 1945 to the position of director of research of the organization. He was married to Marjorie Comstock of Hartford, Conn., in November, 1941, and now has a son three and a half years old. Mitch Marcus has recently joined Studios, Inc., which is now in the process of installing a batch of garnetting machinery for the manufacture of cotton felt. Mitch is assistant to the president.

We were very gratified to read of the posthumous award of the Bronze Star to Harry Whitman, who was killed in a Japanese prison ship in 1944. The presentation to Harry Whitman, Sr., took place at the Grand Rapids recruiting station. You will recall that Harry, who had been a Jap prisoner since the fall of Corregidor, was previously awarded the Legion of Merit (posthumously) for saving the life of a fellow prisoner. We pause and think. — Stanley Backer, *General Secretary*, 101 Providence Road, Primos, Pa. Johan M. Andersen, *Assistant Secretary*, Saddle Hill Farm, Hopkinton, Mass.

1943

I hate to begin the class notes in a new volume of The Review with an excuse for the why's and wherefore's of no class notes in the November issue. For once, however, I have an excellent excuse. Yes, you guessed it, a vacation! Betty and I spent two weeks chasing around the countryside and ended in Cynwyd, Pa., for the wedding of Richard H. Haas and the former Betty Vadner, on September 20. Betty was a roommate of my Betty's at Wellesley ('45 Ra! Ra!). Present at the wedding were best man Hugh Pastoriza and ushers Cal Dunwoody, Gil Graves, and I. Dick is in his last year at Harvard Law; hence he and Betty are now living in Cambridge. Cal Dunwoody is at the Yale school of forestry, learning how to make bigger and better trees; Gil Graves, with the Aluminum Company of America in a New Jersey plant. Hughie Pastoriza is still an electron microscope salesman for R.C.A. I am still at the Institute, trying to become very learned.

During the summer months several engagements were announced. I suspect that most of the couples are by now married, but even though I am very late in reporting this news, I am sure that many of you will still be interested. In the middle of June, the engagement of Eleanor Winnifred McCarthy of Portland, Maine, and James Joseph Shyne was announced. Eleanor is a graduate of Simmons College and during the war was a reports co-ordinator for the Remington Arms Company. Later she took a post with the Dewey and Almy Chemical Company in Cambridge. Bill, who received his master's degree from Pennsylvania State College last February, is now a chemist with the Union Oil Company in Wilmington, Calif. On July 24, the engagement of Helen Eleanor McKenna, whose home is in Englewood, N.J., and John Lusti was announced by the brides' parents. After a tour of duty with the 167th Engineer Combat Battalion, John has taken a post with the Otis Elevator Company in New York.

The engagement of Virginia Frances Doyle and William R. Thurston is also announced. The bride's home is in Saugus, Mass., and she is currently a senior at Connecticut College. Bill is with the General Radio Company in Cambridge. From Garden City, Long Island, I hear that announcement was made of the engagement of Ann Elizabeth Graves and Gregory Gagarin. Greg is with the Westinghouse Corporation. They plan a fall wedding. Also in August, Betty Jane Botham's mother announced her daughter's engagement to James B. Reswick. Betty attended the University of Rochester, and Jim, after a tour of duty in the Pacific with the Navy, is now an instructor at M.I.T. This couple planned an October wedding. A fall wedding was also scheduled for Mary Magna of West Hartford, Conn., and Constantine Maletskos. Mary is a graduate of Smith College and the Hartford Art School. Constantine has returned to the Institute as an instructor in enzymology. Bill Franklin and Florence Muhs Smith of Ridgewood, N.J., are engaged. Bill is currently a chemical engineer at the Bayway refinery of the Standard Oil Company of New Jersey.

Several marriages are also to be noted. The first was that of the former Janet E. Chapman and Harold J. Weiss in Wethersfield, Conn., on May 25. Janet's home is Orlando, Fla., but after returning from their wedding trip the couple will live on Griswold Road in Wethersfield. Harold is currently with the Plax Corporation in Hartford, Conn. A few days later, on May 30, to be exact, and in Great Neck, Long Island, the former Teresa Anne Higgins and John R. Gunther were married. Charlie Crocker, who is now in Japan for the Arthur D. Little Company, was one of the ushers. The bride majored in art at the College of New Rochelle.

The first of four blushing June brides was the former Pamelia Elaine Foss who married William G. Pool in South Sudbury, Mass., on May 31. The Pools will make their home in Alexandria, Va. On the same day, but in Brooklyn, the former May Jo Freese and Thomas M. Bennett were married. Mrs. Bennett is an alumna of St. Joseph's College for Women and taught, before her marriage, in a Brooklyn high school. The couple have made Brooklyn home. The former Lenore Lehn (Wellesley '45) from New Brunswick, N.J., and Bernard Brindis were married on June 24 in the Waldorf-Astoria in New York. After a wedding trip in eastern Canada, the Brindises will live in Haverhill, Mass. On June 28, in Scarsdale, N.Y., the former Betty Legler and Robert W. Byloff were married. This couple spent their honeymoon at Sea Island, Ga., and returned to 155 East 93d Street, N.Y.

In July, on the 24th, in the "Little Church Around the Corner," in New York, the former Rita F. Mayes and John A. Thoerle, Jr., were married. The bride, after graduation from the Williamsport school of nursing, was an airline stewardess for more than a year. This couple is living in Jackson Heights, L.I. On August 30, in Cleveland, Ohio, Maria Luisa Fernandez and Eduardo Baranano da Costa were married. My last wedding news is that of the former Lydia Isabel Hamilton and Rowland E. Hill on September 5 in Newton, Mass. The Hills went to Nantucket on their wedding trip and will be at home in Methuen, Mass. The groom is a mechanical engineer with the Bolta Company in Lawrence, Mass.

Now for a little news of others. Melville Clark is studying more physics at Harvard, and Bob Reebie has returned to Technology. Bill Cochran has also come back for more aeronautical engineering at M.I.T. You will recall that he signed on for extra time in the Marine Air Corps, but is now on terminal leave. Frank French is working on his doctoral thesis in chemical engineering and expects to complete his work in June. I see Roland Grandgent in the M.I.T. hallways once in a while. Lewis Lipschutz is back at M.I.T. after spending a summer in England. John McMullin also is seen once in a while. Bob Maxwell is taking a few courses in addition to other work at the Institute. Kemp Maples is around, too. Eliot Payson is preparing for a vice-presidency in some company soon by going to the Harvard Business School. Bob Miller has been appointed to the research staff of the Battelle Memorial Institute in Columbus, Ohio. Bedrich Hettich is apparently in Tokyo. Charles L. Estes is with the International Telephone and Telegraph Company in New York.

In a note from Bob Rorschach we read the following: "After 17 months of sea duty as an electronics officer on a transport in the Pacific, I was released to inactive duty in July, 1946, and spent the remainder of the summer vacationing. In the fall, I commenced graduate work at the University of Tulsa, receiving my M.S. degree in petroleum refining last May. The following month I was married to Susan Sample of Tulsa and on July 1 began work in the Fischer-Tropsch-Synthol pilot plant of Stanolind Oil and Gas Company in Tulsa. Some of the Course X boys may be interested to learn that Scott Walker '40, late of 10-18, is now director of process development there."

And, finally, we are very glad to hear that Curt Smith is at long last on the way to recovery after a long illness. He returned to M.I.T. in February, 1947, and early in the summer was sent to a Boston hospital, where he remained for several months; he was later transferred to a Chicago hospital, in which he must stay for a month or two longer. He says that he and Barbara have found another home (their ninth!) at 2004 Stanton Avenue, Whiting, Ind. Good luck to you, Curt, and we hope that you will soon be able to get around again. — CLINTON C. KEMP, *General Secretary*, Barrington Court, 988 Memorial Drive, Cambridge 38, Mass.

1944 (2-44)

Most of the boys have now been graduated from the Institute except for about 18. One of the undergraduates who will be back after a summer fling over in Norway is Dixie Ward. Dixie went over under the United Nations exchange student deal, and judging from the reports I have received, he enjoyed himself socially. — A letter from Lew Tyree tells of his new job in the Joy Manufacturing Company at Michigan City, Ind. Lew is an assistant to an assistant and has his own desk and dictaphone, plus a telephone with accompanying small office. He has the added advantage of being only an hour and a half from downtown Chicago. — Not very long before I came back East, I saw Harry Dickey and his wife in Detroit. They had come up from Toledo to a party of the Eastwood Gardens, a local dancing pavilion. Harry got his final degree from the University of Toledo. He is working for his dad in the Dickey Manufacturing Company, which produces awnings, tents, Venetian blinds, and so on. — Egilda de Amicis has received a research appointment at Harvard University, where she will be engaged in cancer and gangrene research at the Medical School. Before her appointment, she was a member of the staff at both Technology and Northeastern.

Dave Jealous has written us information on where some of the boys have gone. He has accepted a job with General Electric. Cavicchi and Garrard have both been assigned to G.E. at Lynn. Jay Martin has joined the same outfit at Bloomfield. Hank Lawton is at Pittsburgh with Westinghouse. Sej Harjes is reported to be with the Calvert Whiskey firm. I always knew he wanted to have a sure source of that golden liquid. Sten Hammarstrom was stationed at the Holabird Ordnance Depot, Baltimore, Md., at the beginning of the summer and planned to re-enter Tech this fall. Frank Carroll has joined the engineering department of the Timber Engineering Company in Washington, D.C. Frank will devote his time to structural designing, timber testing, and sales promotion work with architects, engineers, and contractors. Tom Carmody has been reappointed to the staff of the University of Delaware; he is applying work on extractive distillation toward a master's degree.

Many of the boys are taking the fatal step. An overseas note tells of the marriage of Risto Hukki to Lilja Vanhapihalast in August in Helsinki. Lilja is a nurse in a new children's hospital and was instrumental in saving the life of the baby boy of one of Risto's students. — Willard Little married Ann Chapin of Salisbury, Mass., last June. Ann is a graduate of Sargent College. Willard is employed by the Shell Oil Company in Rutherford, N.J. They will live in Orange, N. J. — Fred Stearns is now married to Helen Sullivan of Augusta, Maine. Helen is a graduate of Lasell Junior College and served as a Wave during the war. Fred is working in the sales engineering department of the Spencer Thermostat Company at Attleboro, Mass. — Mort Meyer has become engaged to Jean Lewis of London, England. Mort met her while he was stationed in England with the Combat Engineers. — Announcement is also made of the engagement of Harriet Kurlan to Bill Vaisman of Lima, Peru. Bill is heading the Industrial Corporation of Peru, and they will live in Lima after their marriage next month. — John Holloway has married Elizabeth Zerkel of Washington, D.C. She is a graduate of the Pratt Institute and Columbia University. John did graduate work at the Institute and is now a nuclear physicist with the Naval Research Laboratory.

Elizabeth Sackmann of Maplewood, N.J., and Donald Black of Jacksonville, Fla., were married on September 27. She is a graduate of Mount Holyoke College, received her master's degree in chemistry from Technology last February, and is employed in the research laboratories of Merck and Company. Don received his degree of doctor of philosophy in Chemistry at Tech in September and is with the Monsanto Chemical Company in Everett, Mass. — Dick Bersohn's wedding to Virginia Straus, a Vassar graduate, took place last August at Harrison, N.Y. Dick is going to attend the Harvard Graduate School this fall. Speaking of Harvard, yours truly is going to the Business School this fall. — Alison Martin became the bride of Bill Harper last July. Bill is a sales engineer and will be in Chicago for six months prior to permanent employment in Detroit. — Eleanora Otto, a Radcliffe graduate, has announced her engagement to Bob Halfman. Charles Butler is to wed Connie Arnoldy of Detroit, Mich. Norman Beecher is engaged to Nancy Bartram of Nitro, W.Va. Dick Maconi has married Mary West of Wellsboro, Pa. George Barr's engagement to Mildred Marks of Chestnut Hill has been announced. Mildred is a graduate of Cornell University. — Ty Tyberghein tells of the marriage of Reilly, White, deAgazio, Berinsky, Maxson, and himself. The Reilly family had a new addition in July. Ty is planning to work for the Michigan Bell Telephone Company.

Here at the Harvard Business School, I have seen Clyde Snyder, Bob Oppenlander, Cort Ames, Newton Feldman, Bruce Fabens, Joseph Schaefer, and Thornton Smith. Steve Knight, who will be graduated from the Institute next February, has a son of three months. Bob Breck has joined Bob Platchta at Filene's. They are working in the new industrial relations section of that store. Bill Clark is working for the Standard Oil Company of New Jersey. Ken Nelson is now running his father's automobile agency in New York. Edward Thode and Walter Turner have been added to the University of Maine engineering departments. Chris Roden has quit the Ford Motor Company in order to take off for graduate school at Stanford in California. He plans to settle permanently in that state after getting his master's degree. — WILLIAM B. SCOTT, *General Secretary*, McCulloch D-36, Harvard Business School, Boston 63, Mass.

1945 (10–44)

What are you doing these days? Married yet? Have you seen any of the fellows from Tech? Rings familiar, doesn't it? Every one of us has greeted some long lost friend in the same way. Please drop me a note about these chance meetings and yourselves.

It was this chronicler's luck to see several Alumni long enough to get their recent histories. Bob Heaton is in the East temporarily for training at General Electric's air conditioning school in New Jersey. After leaving Technology, he served in the Pacific for two years as an engineering officer aboard the CVE U.S.S. *Anzio*. On January 3, 1946, he married Hilma Manig. Soon after, the Heatons were in Cambridge, where Bob got his S.B. in Course IX this past summer. Within a few weeks he will finish at General Electric; then the Heatons are going to settle in Oakland, Calif. Bob will start there as engineer for the General Air Conditioning and Heating Company.

In Cleveland, King Cayce is fulfilling many of our great expectations for him. As general manager of the Rod Cutting Company, he is mass producing spark plugs and other accurate machine parts. When last seen he was rearranging his production line and planning a plant expansion. Although working hard, King has not lost his party touch. Near Cleveland, in Rocky River, Chuck Simpson spent the summer winning most of the available sailing cups. He recently joined the working group as a public relations manager of North Ohio, for one of the national oil companies. Chuck's duties consist primarily of traveling and entertaining. All who know him will vouch that this playboy has found a tailor-fit job.

Fred Schierbaum, trained in naval architecture and marine transportation, has strayed far to a profitable field. He started his own plastic compounding and moulding company. In this short time he has become a leading authority on plastic moulding and expects his book on the subject to be published soon. Butch Buccini and R. Hewitt Townsend have come to New York City to join the American Machine and Foundry Company. Alfonso Guzman da Silva is now sales engineering for the Corporacion Commercial Sudamericana of Lima, Peru.

The Army Signal Corps kept Jim Robertson in the Pacific for two years. As soon as he was released, he returned to the Institute. When he was graduated this spring, Jim began work in the sales specifications department of the General Electric Company in New York City. About the same time a Chestnut Hill and Simmons girl, Dorothy O'Hearn, began wearing their engagement ring. Another Jim, but of the Healy family, realized several ambitions recently. He was promoted to Alcoa Steamship Company's management research group. His work includes a project which will more completely systematize the company's operations. Pretty Mary Helene McLoughlin accepted Jim's marriage proposal last July; the ceremony will be held on November 29.

The latest engagement announcements include the following: Mary E. Cornu of Smith College and Seattle, Wash., to Jim Shipton, a Phi Gamma, now working for Eastman Kodak in Rochester; Harriet Hall of Smith and Quincy, Mass., to Donald Tucker of the Number Six Club, now attending Boston University's medical school; Nancy R. Hauser of Wheaton College and Bethlehem, Pa., to Ben Moore, who recently received his B.S. in civil engineering from Lehigh University; Dorothy R. Phillips, of Pratt Institute and Richmond Hill, N.Y., to Bill Henderson, Jr., who is now with an air conditioning firm in Syracuse, N.Y.; Janice K. Campbell of Lynchburg College, the University of Virginia, and Washington, D.C., to Bob D. Seymour of Cobleskill, N.Y., who recently returned from overseas duty with the laboratory division of the Army Medical Corps.

The marrying month of June saw our Class well represented. Jim C. Burbank received the hand of Laura Lee Wiley of Connecticut College and Hartford, Conn. They will live in Hartford, where Jim works for the Twitchell Champlin Company. Carl G. Erikson received the hand of Gertrude E. Dahlquist of Hickox Secretarial School and Boston. Jacques Dubois joined Lucille Gauthier of the College of New Rochelle and Providence, R.I. Andres Antonio Freites Barrera of Ciudad Trujillo, where he worked for the Standard Oil Company, married Antonia Evangelina Vasquez Gautier of New York City. Peter Dolan Matthews was wed to Diana Ostrom Perry of the University of Michigan and Wellesley Hills; Larry W. Spear, to Shirley Joy Shapiro of Wheaton College and Newton Center, Mass.; Bill Stahlman, to Rita Catherine Byrnes, of Hartford, Conn.

We heard of five other weddings during the summer: Bruce Lamberton, who is now working with De Leuw Cather and Company, consulting engineers of Chicago, was married to Jacquelyn Edmunds of Simmons College and Brookline, Mass.; John White, now with the Consumers Water Company of Portland, to Marian Morton of Smith College and Cambridge, Mass.; R. Hewitt Townsend, to Louise R. Bruce of the University of Louisville and Louisville, Ky.; Dave V. Collins, Phi Beta Kappa and Kappa Sigma fraternities, to Frances Wilmoth of Georgetown College in Kentucky; C. Reginald Robba to Jean M. Corry of West Hempstead, L.I.

If any of you want to pass on news of your friends or yourselves, it would be best to try me at my new office. I am with the Reinhold Publishing Corporation at 330 West 42d Street, New York, N.Y., selling advertising space for the American Chemical Society magazines. You'll call or write soon, won't you? — JAMES S. MULHOLLAND, JR., *General Secretary*, 1172–77th Street, Brooklyn 28, N.Y. *Assistant Secretaries:* RODERICK L. HARRIS, 2873 South Buchanan Street, Fairlington, Arlington, Va.; JAMES B. ANGELL, M.I.T. Graduate House, Cambridge 39, Mass.

1946 (2–46)

There is much ground to cover this time. Some of this material will necessarily be a little stale, but please stick with me — you're bound to discover some tidbit that's a surprise. Your Secretary gives Tom Kelley a big vote of thanks for both himself and the Class for carrying the literary ball and writing these notes for the past year. The returns from the information letter sent out have been warmly encouraging — keep up the good spirit, and remember that you're not the only quasi hermit in the Class.

Already established in the fast-growing ranks of the old married men are Art Verrier and Bill Humphrey. Art was married last year to the former Claire M. Doonan in Providence, while Bill exchanged vows with the former Jayne W. Madden in Greenwich, Conn. Howie Auerswald married Doris Oechsle of Longmeadow, Mass., in June, with Stan Harshman '47, Gabe Ciccone '47, and Martin Ray as ushers. Howie has been doing postgraduate work at the Institute, but he was planning to enter the Harvard Business School this fall. Samuel Gusman married Carolyn Strauss on June 29 in New York. Hugh Jackson and Ellin Early were married in Salisbury, Md., last June. Hugh is in Philadelphia, working for the Atlantic Refining Company in their research laboratory. Frank Westcott married Patricia Doherty in Bronxville, N.Y., and now resides in Attleboro, Mass. Glen Dorflinger and Phyllis Fisher of Clarksburg, W. Va., were married in New York last June, while roommate Ray Brown married Betty Mason of Pittsburgh in Philadelphia. These two weddings coincided (almost to the minute), so that the classmate friends were scattered between the two. Rog Sonnabend and Jim Craig ushered for Dorf, while Bill Jackson attended Ray, and Bob Spoerl and Bob Taylor ushered. My memory isn't very clear on the happenings of that day, but Ken Davis, Ned Tebbetts, George Ley, and Stu Kennedy were at one, or the other, wedding. Jim Corbett married Frances Gerkin in Patuxent River, Md. Jim is in the Navy now and stationed at the Naval Air Test Center in Patuxent River. Fred Ames and the former WAVE lieutenant, Geneva Malik, were married in Medford. Bob Bolger married Jane C. Walker last March in Boston. Al Kent and Bob Mark ushered. Bob will finish at the Harvard Business School this spring. Frank Stevens, a displaced classmate, married Katherine R. Loomis in Huntington, Mass., this July. Frank, also, was to enter the Harvard Business School this fall. In previous class notes the engagement of Mary Driscoll and Herb Keating was announced. Herb and Mary tied the knots recently, on September

14, in Boston. Bruce Curran and Hazel Hoy were married in Charleston, W.Va., in late August.

The list of those engaged to be married grows longer by the day. Lawrence Body and Virginia Nielsen of Lexington Park announced their intentions last June. Larry is a naval ensign stationed at the Patuxent River air test center. Other engagements are those of the following couples: Bill Jackson and Mary S. Otto of Scarsdale, N.Y.; Jack Haverback and Joanne D. Levitov of Los Angeles; Bob Lathlaen and Nancy E. Nichols of Lansdowne, Pa.; Alexander McEwan and Charlotte E. Brown of Springfield, Mass.; Bob Lindberg and Shirley Olson of Seattle, Wash.; Mansoor Rafaat and Martha J. Ferrenz of Washington, D.C.; Bob Wentsch and Rose Wichlatz of Jamaica, N.Y.; John Perry and Maude van Bellingham; Jack Hawthorne and Patricia Cutler of Milwaukee, Wis.; and Clarence S. Lyon, an ensign in the United States Navy, and Patricia Curley of Brighton. Bob Walters and his wife, Frances, are the proud parents of a daughter born in March. Karen Ruth Walters is one of the first babies in the Class.

In addition to those already mentioned as starting at the Harvard Business School, Rog Sonnabend, Ed Hill, and Jim Craig were to be in Cambridge this fall learning about the almighty dollar. Stu Edgerly will finish there this spring, while Ray Brown and Bob Spoerl will do the same at Columbia's business school. Ken Davis was venturing to Leland Stanford to study business, and Ned Tebbets will be cavorting around Michigan's campus at Ann Arbor. Our Class Agent, Howie Perlmutter, who's been studying psychology at Clark University, will work for his Ph.D. and do some teaching at the University of Kansas. Howie plans to do psychiatric work in industry later on. Ed Bean is studying at Georgetown University's law school and working in the United States Patent Office. Herb Hansell is still hard at work at the Yale law school. Ted Heuchling is grimly holding on at Technology, bent on a master's degree. Ted will finish in June, at which time he says he "may think seriously of going to work." Colin Roberts, who married Elizabeth Budlong last year, is working for the Manufacturers Mutual Fire Insurance Company. Don Burke is at the M.K.M. Hosiery Mill in Rochdale, Mass., and Bob Hoffman is in the research department of the Worthington Pump and Machinery Corporation. Bill Pierce is with the Brown Instrument Company in Philadelphia. John Perry is with General Electric in Lynn, Bill Jackson is selling for the Bonney Forge and Tool Works, and Glen Dorflinger is doing the same for the York Ice Machine Company.

Graduated recently from West Point and Annapolis, respectively, were C. Arthur Borg and Peter N. Kyros. Bob O'Donnell is working for the California Research Corporation. Ned Spencer is working for Bell Aircraft Corporation and plans to stay put for a while. Ned gave your Secretary some very good reasons why our Class should stay uncombined, by the way. Al Kent is in the research department of the Curtiss-Wright Corporation. Al's future plans include the procurement of a farm, no less. Shelton Johnson is a consultant for a chemical company and plans to go into the chemical manufacturing business in the Southeast later on. Roger Bart is now in the Chemical Engineering practice school and plans to work for his doctor's degree. Norm Kreisman is studying at M.I.T., and Charles Neumann is at the University of Chicago continuing a study of meterology. Johnny Wandrisco finished a spell with the Latrobe Electric Steel Company and is now at the Harvard Business School. — JAMES S. CRAIG, *General Secretary*, Morris D-41, Harvard Business School, Boston 63, Mass.

1947

Despite the *Wall Street Journal*'s pregraduation account of the superfluity of jobs and positions awaiting the graduates of M.I.T.'s Class of '47, it seems that the old undergraduate ties were too strong for many of our classmates, including your Secretary, for the Graduate School seems to be rife with returned '47 men. Just to mention the few we've bumped into in the short time that school has been open for the fall session — Arnie Judson, Don Kuehl, Oiva Anderson, Pedro Picornell, Red Bois, Leo Celniker, Don Kornreich, Paul de Mello, Bob Hildebrand, Dick Seaman, Jack Hill, Yohay Eckhardt (the last three rooming together in the Graduate House), Bob Kraichnan, Sid Smith, Harry Lighthall, Vic Mayper, Nilo Lindgren, Pete Poulos, Carl Newman, Dick Scheuing, Luis Cardosa, Marty Schwartz, Jim van Meter, Obie Hartman, Bob Balluffi, Mel Zisfein, Muzzy Unsal, and Bob Stevenson.

Besides these loyal Tech men, many of our classmates are back at the Institute, but working for the Division of Industrial Coöperation. Al Steinmayer, Larry Michel, Tim O'Brien, Kenny Wetmore, Art Roberts, Marv Sweeney, Howie Zwemer, Dave Clapp, Sebron Haley, Dave Knodel, and Joe Dionne are those we've seen so far.

The little red schoolhouse up the river has claimed one or two of our number, also. In fact, our Prexy, Norm Holland, is one of the worst offenders, planning to spend three years up there in law school. Your Secretary spent a most pleasant afternoon with Norm one Sunday a few weeks ago, and if any of you care to get in touch with him, he is living at 411 Marlborough Street, Boston. He tells us, by the way, that Ed Bennett is doing graduate work at Purdue University and instructing in D.C. Machinery at the same time. Another Harvard man is Jack Rizika, who is taking three courses up there and two here.

Phil Solomon is teaching applied mechanics and aerodynamics at Boston University; Pete Nairn is going to a small business school just outside Boston for a year; but of course, not everyone turned a deaf ear to the call of industrial America, for announcements are pouring in about our buddies who are now full-fledged engineers, earning a weekly salary, and not having to worry about what assignment is due when.

Al Openshaw is an assistant engineer for the Mohawk Carpet Company, assigned to its Dublin, Va., plant. Bob Lombard is with American Telephone and Telegraph, and we've received word that John Midney is attached to the propulsion research group of Chance Vought in Bridgeport, Conn. Bob Warner and Bob Mack are also with the same company; Bob Bryant is with Grumman in their flight-test division. Larry Vassamillet has accepted a research position with the Monsanto Chemical Company, in Dalton, Ohio; and Al Becker has been appointed to the instructing staff of the University of Missouri. Fred Ehrich was awarded a one-year fellowship to the University of Delft in Holland.

The Battelle Memorial Institute, an industrial and scientific research organization in Columbus, Ohio, has claimed a number of our fellow graduates, including Vic Ragni, and Howie Adam. Both Harry Turner and Leonard Winship have completed orientation courses in supervisory and technical responsibility with International Telephone and Telegraph Corporation and are now receiving additional training with the company's manufacturing affiliates. Harry Brodsky is with Fafnir Bearings, Inc., of New Britain, Conn.

Many of our finest have succumbed to the wiles of femininity, for engagements and marriages are the order of the day, and there is an apparently steady stream of classmates marching to the altar. Gene Schnell was one of the first; his marriage to Lillian Adele Rosenstadt of Maplewood, N.J., took place barely two weeks after graduation. Joe Kaufman and Bob Schick, Gene's old roommates were on hand to lend moral support in the capacity of ushers. Another early bird was Al Thompson, who wed Corliss Anne Whitney of Avon, Mass., soon after receiving his degree.

Steve Dieckmann and his bride, the former Margaret Connelly of Hopkington, are now residing in Wilmington, Del., after a September wedding. Ed Sadowsky and Dolores Skudlarek of Chelsea were wed in June, as were Sidney Grob and Edna Fishman of Lynn. Ken Wright took Marguerite Fleming of Washington, D.C., as his wife in June, and Justin Margolskee and Helene Jacqueline Friedman of Beverly were united at about the same time.

Malcolm McFaull and Frances Ann Morris of Jackson Heights, L.I., are man and wife; also Bob Pietsch and Elizabeth Osborne Hill of Rochester, N.Y. Other newlyweds include Caspar Schneider and Elizabeth Margaret Manske of Grymes Hill, Staten Island; Stan Landgraf and Priscilla Tite of Pittsburgh; Dick Potter and Dorothy Hoxie of East Milton; Hank Rice and Insley Christine Gove of Wakefield; and Joseph Gold and Aileen P. Siefert of Jamaica, N. Y.

Engagements are almost as numerous as weddings, and many have probably taken the fatal step. At last word engaged, but possibly married by now, are Bob Breck to Priscilla Buttner of Plymouth; Bud Palitz to Carol Ellen Joseloff of West Hartford, Conn.; Bob Keepin to Madge Mary Twomey of Shawsheen Village, Mass.; Bill Baker to Betsy Green of Kennett Square, Pa.; Leland Stanley to Gloria Cardarelli of Brookline; John Hanson to Susan Gilman of Cambridge (married September 27); Ken Keating to Charlotte Adelle Matthews of Boston; and Kermit Greene to Elinore Ziff of Northampton.

Undoubtedly many of you have news of yourselves — a new $15,000-a-year job, a new addition to the family, or just a change of residence. We're hoping to be swamped with letters, so drop us a line anytime. — CLAUDE W. BRENNER, *General Secretary*, Box 424A, Graduate House, M.I.T., Cambridge 39, Mass.

RUMFORD PRESS
CONCORD, N. H.

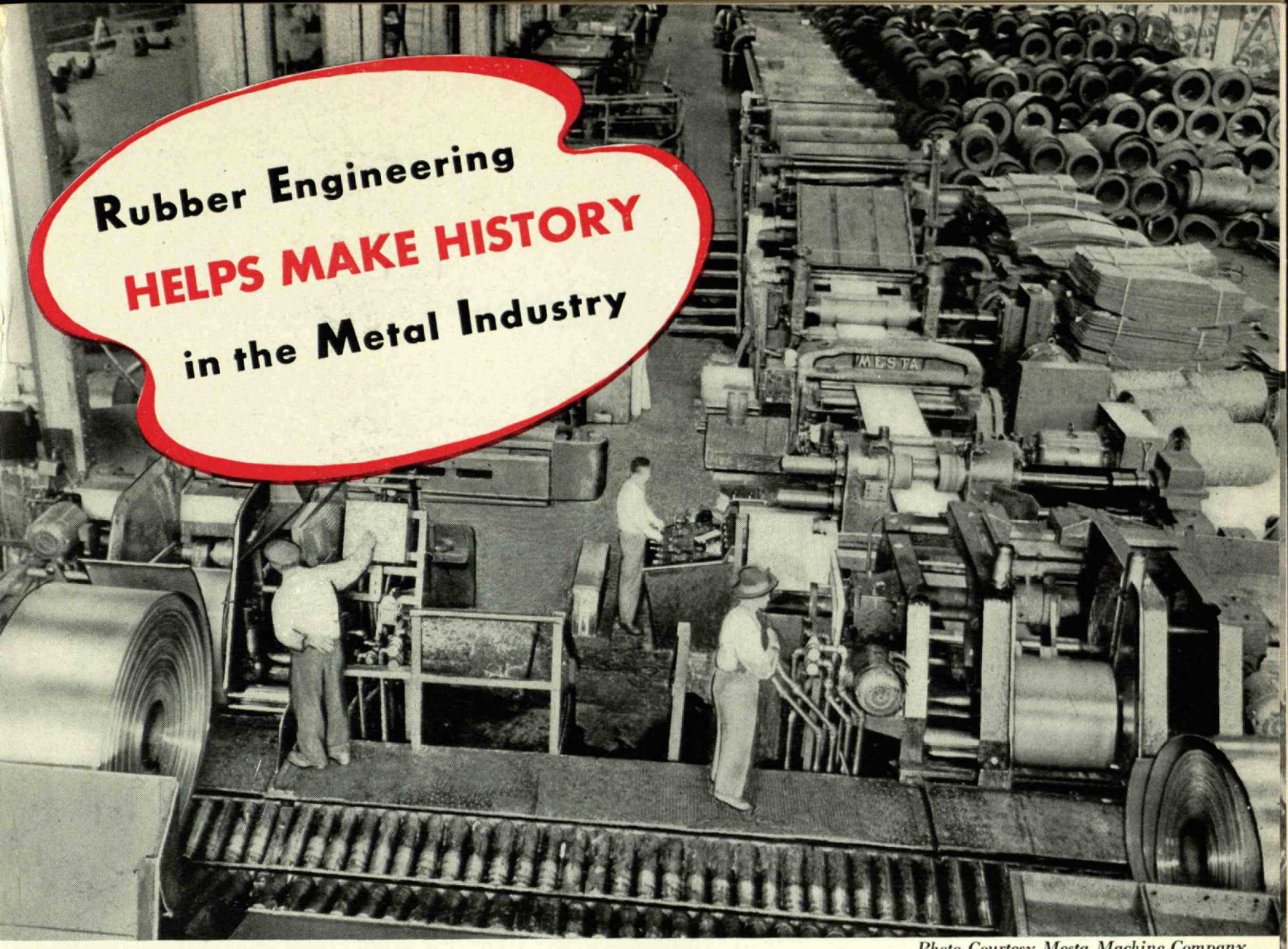


Photo Courtesy Mesta Machine Company

When a large steel plant demanded a faster method of pickling sheet steel, engineers literally made history in the steel industry with specifications for the huge continuous strip pickling lines pictured above.

Playing a major collaborating role—with one of the most vital materials required in the specifications—were the Manhattan engineers and their knowledge of rubber. Applying their technical skill and background of 40-years' rubber lining experience, they helped solve every problem of rubber lining and rubber covering this giant job presented.

The line featured above is rubber-protected 100% by Manhattan including rubber-lined drip-troughs, rubber-lined piping, rubber-covered rolls, and other rubber products.

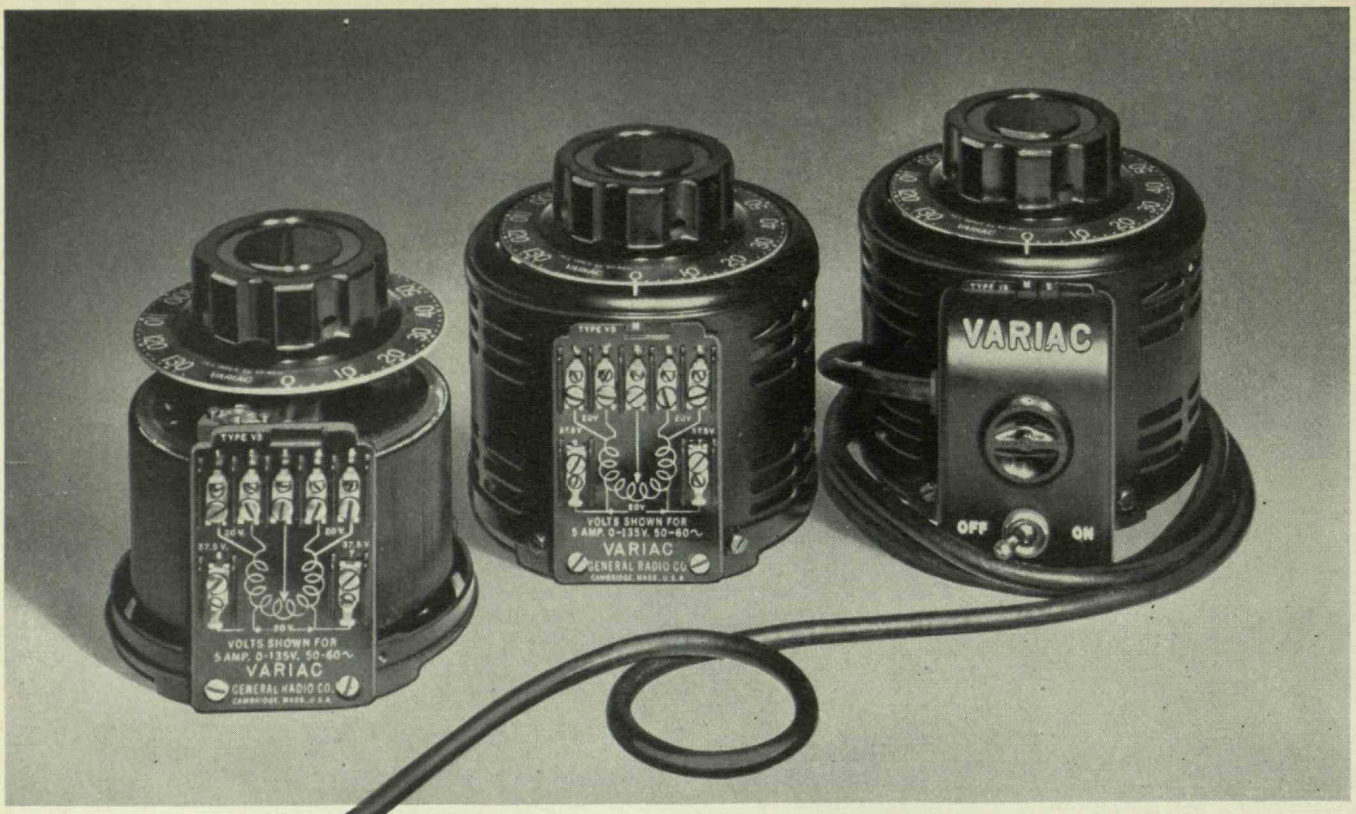
Huge acid tanks were handled easily with Manhattan's facilities and the difficult work of designing and lining overlapping, sectionalized hoods, complicated by exhaust outlets, etc., was accomplished successfully.

Manhattan is widely acknowledged as the "safest bet" in rubber-protecting important and irreplaceable equipment such as this history-making strip pickling line. Ask a Manhattan engineer for advice in safeguarding *your* important processing equipment. ***Keep Ahead with MANHATTAN.***

RAYBESTOS-MANHATTAN, INC.

MANHATTAN RUBBER DIVISION

EXECUTIVE OFFICES AND FACTORIES — PASSAIC, NEW JERSEY



VARIAC* VOLTAGE CONTROLS

THE Type V-5 VARIAC is the most popular of a number of different models. For over- and under-voltage testing, compensation for varying line voltages, and general a-c power, heat, speed and light control, its rating of 862 volt-amperes seems to cover a majority of applications.

We have been concentrating our VARIAC production facilities on this model and are gradually getting out of the woods.

The Type V-5, like others in the new "V" series, is a decided improvement over its predecessors. Lighter in weight by 25%, with new unit brush construction which cannot cause damage to the winding if the brush wears down, having a heavy-duty line switch, equipped with a polarity indicator in the convenience "load" outlet, provided with a new molded terminal plate for either screw or solder connections, and furnished with a newly designed knob and dial with big calibration figures for reading at a distance, these new VARIACS are more convenient to use . . . more efficient in operation . . . last longer.

The VARIAC is the *ideal* a-c voltage control. It has the convenience of the rheostat with the efficiency of the transformer; unlike a rheostat it provides control voltages 17 per cent *higher* than the line voltage . . . and these voltages are continuously adjustable from ZERO.

SPECIFICATIONS†	115-Volt TYPE V-5		230-Volt TYPE V-5H	
LOAD RATING (KVA)	**.862**		**.575**	
Input Voltage	115		230 or 115	
Output Voltage, ZERO to	135 or 115		270 or 230	
Rated Current (Amps.)	5		2 or 1	
Max. Current (Amps.)	7.5		2.5	
PRICE—Unmounted (1)	**TYPE V-5**	**$18.50**	**TYPE V-5H**	**$21.00**
" —Cased (2)	**TYPE V-5M**	**20.50**	**TYPE V-5HM**	**23.00**
" —Mounted (3)	**TYPE V-5MT**	**25.00**	**TYPE V-5HMT**	**27.50**

(1) At left in illustration
(2) Center of illustration
(3) At right of illustration
† All performance data for 60-cycle operation

The 230-volt models (V-5H) are similar in external appearance and size to the corresponding 115-volt (V-5) units shown in the illustration

** Reg. U. S. Pat. Off. VARIACS are patented under U. S. Pat. No. 2,009,013 and British Pat. No. 439,567. The VARIAC — and original continuously-adjustable transformer — is manufactured and sold exclusively by General Radio Company or its authorized agents.*

ORDER NOW!

Prompt shipment probably can be made on all models of the Type V-5.

GENERAL RADIO COMPANY Cambridge 39, Massachusetts

90 West St., New York 6 — 920 S. Michigan Ave., Chicago 5 — 950 N. Highland Ave., Los Angeles 38